Measuring fairness?
The political ecology of compulsory water metering in South East England

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Thesis submitted in accordance with the
requirements for the degree of Doctor of Philosophy in
Geography
King's College, University of London

Contents

Abstract

Taking inspiration from Foucauldian work on governmentality and historical materialist approaches, this thesis examines the political ecology of compulsory water metering in the South East of England. Here, three main contributions are offered. First, a genealogy of water metering (1840 to 2009) is developed in order to demonstrate the multiple ways that the meter has been used to help negotiate different understandings of the waterscape. Secondly, contemporary compulsory metering programmes are positioned as a socio-technical fix where water companies have attempted to, at least partially, resolve a tension between water stress and household water demand and, at the same time, secure the continuation of the broadly neoliberal waterscape. Finally, the thesis examines the unanticipated outcomes of compulsory metering; it focuses on how affordability has been reframed as an important and immediate governance problem that requires private water companies to take on new roles, sometimes reluctantly, as water welfare providers.

Acknowledgements

It almost goes without saying that while doctoral research is the product of independent work, it would not be possible without the help, advice and patience of others. I hope that I can use this space to thank many of the people who have contributed their time, ideas and support so generously. Of course, responsibility for the views expressed in the thesis remains my own.

Firstly, I would like to thank my supervisors Alex Loftus and Vandana Desai for their support throughout the process of applying for and completing my masters and doctoral research. I am extremely grateful for their thoughtful suggestions, advice and good humour. I would also like to thank them both for encouraging and supporting me in pursuing other opportunities throughout the course of the PhD. I found teaching and undertaking an ESRC internship at the House of Commons' Scrutiny Unit particularly rewarding.

I would also extend a warm thank you to friends and colleagues within the Department of Geography at Royal Holloway, University of London and King's College London. In particular, I am very grateful for the friendship and advice of Richard Bater, Andrew Brooks, Mia Hunt and Steve Jones. I would also like to thank Gareth Walker who saved an Environment Agency Water Demand library from the current government's austerity plan and found a space for it at the Radcliffe library before it could be destroyed. Thanks also to the external examiners of my thesis, Mark Whitehead and Emanuel Lobina for their provoking questioning and their constructive comments which have helped strengthen this thesis.

I am also grateful to my friends and family for their encouragement; especially my parents for their ongoing positivity and Paul Kell for his support (and patience!) throughout the entirety of the process.

Finally, but perhaps most importantly, I am extremely grateful to all research participants who made this thesis possible. It is not possible to list them all here, yet I am grateful to all who took the time to share their thoughts and experiences of water at home and at work. I am thankful for funding from the Economic and Social Research Council for the whole PhD (and Masters), without which none of this would be possible.

List of Tables

List of Figures

List of Abbreviations

AMR	Automated Meter Reading
CAB	Citizens' Advice Bureau
CAWC	Central Advisory Water Committee
CCW	Consumer Council for Water
CIEH	Chartered Institute for Environmental Health
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ICE	Institution of Civil Engineers
IMD	Indices of Multiple Deprivation
PCC	Per Capita Consumption
PUAF	Public Utilities Access Forum
RCM	Revenue Correction Mechanism
RCV	Regulatory Capital Value
RWA	Regional Water Association
SEW	South East Water
SRN	Southern Water
STS	Science and Technology Studies
TW	Thames Water
WRB	Water Resources Board
WRMP	Water Resources Management Plan

1 An introduction to governing water in South East England

1.1 Introduction

In 2010, two water companies in South East England, Southern Water (SRN) and South East Water (SEW), embarked on the first companywide domestic compulsory water metering programmes undertaken in England and Wales. Although, as this thesis demonstrates, the desirability and feasibility of metering has been debated vociferously since the introduction of constant supply in the Victorian era, compulsory metering on such a grand scale was unprecedented. Indeed the prevalence of water metering in England and Wales is much lower than levels in other European countries. Prior to the advent of these programmes, the rate of meter penetration for SRN and SEW was close to 40 per cent and, overall, just 30 per cent of households were charged for water services by means of a meter across the entirety of England and Wales. Such a radical reconfiguration of the waterscape, a transition to charging for water by volume, signifies a fundamental challenge to how water and water users have been governed.

Water metering in England and Wales has rarely been analysed in depth with processes of privatisation (Bakker, 2004), economic regulation (Helm, 1995; Littlechild, 1986; Saal and Parker, 2001; Shaoul, 1997), flood and drought (Taylor et al, 2009), water practices (Pullinger et al, 2013) and broader modes of governance tacking precedence (Haughton, 2002; Chappells and Medd, 2008, for notable exceptions see Drakeford, 1998 and Knamiller and Sharp, 2009). Although the introduction of compulsory metering could be construed as a relatively mundane, everyday event, these programmes represent much more than an alteration in the charging arrangements for water services. Rather, companywide compulsory metering is of considerable interest because it provokes important and pressing conceptual questions regarding how households in relatively wealthy nations should access water in the twenty first century.

Domestic water use has recently come under considerable scrutiny. This is in part because household water use now accounts for more than half (52% or 7, 756 megalitres per day) of all public water supply in England and Wales (Defra, 2008: 19). The proportion of water used for domestic purposes has increased since 1950 as a result of population growth and changes

in household water use practices. Customer leakage and company leakage accounts for a further six and 17 per cent of the public water supply respectively. By comparison, usage by commercial and industrial sectors (including agriculture) has declined and now, combined, these sectors use 23% (or 3, 500 megalitres per day) of the public water supply. This, in part, reflects the changing shape of UK industrial trends and outputs (ibid). Domestic water metering programmes have been offered as an important way of better managing the supply and demand balance in water stressed areas and producing a fairer water charging system. The hope is that water loss will be minimised through enhanced leakage detection and that volumetric pricing and economic incentives will inspire households to curb profligate usage. In this context, water metering technologies in the South East of England play a vital role in remodelling the relationships between the environment, water users and society.

In turn, this raises a number of interrelated issues that demand further attention. For instance, does metering alter the way that people relate to and understand water? How might the introduction of compulsory metering influence the process by which water is 'valued'? What counts as profligate use? How should the costs of water services be allocated and what does charging by volume mean for understandings of fairness in relation to water provision? These questions are all vitally important when considering how water should be accessed in the contemporary moment. It is clear that the study of water metering matters because the introduction of this technology has the potential to profoundly influence the shape and form of the waterscape.

Taking inspiration from Foucauldian work on governmentality and historical materialist approaches this thesis examines the political ecology of compulsory water metering in South East England. More specifically, it analyses how compulsory metering emerged as a desirable and legitimate strategy as well as how the introduction of such programmes has influenced the ways that water and water users are governed. Although there are tensions between these bodies of literature, when brought together they have much to offer in terms of better understanding the relationships between technology, society and nature. Foucault's work on genealogy and governmentality provide fantastic tools for tracing how particular regimes of governance materialise and, in particular, his insights into the processes of governing others and self-government are vital for unpicking how water and water users are governed. Indeed, Foucault's work on governmentality has inspired a wealth of literature on 'green governmentality' despite discussion of environmental issues falling outside of his own

oeuvre. Meanwhile historical materialist work on the production of nature has expertly exposed the dynamic ways that the waterscape, as a messy combination of society, technology and nature, evolve in capitalist societies. Chapter two explains that although there are important tensions between these bodies of literature that should not be elided, insights from Foucault's work and historical materialist work, particularly that of Harvey and his framework of 'moments' provide powerful theoretical framework for better understanding the political ecology of compulsory water metering in the South East of England.

Overall, this thesis offers three main contributions. First, a genealogy of water metering (1840 to present) is developed to demonstrate the multiple ways the meter has been used to help negotiate different understandings of the waterscape. This historicises contemporary compulsory programmes and highlights how early experiments with metering have, to an extent, set in motion a recurring conflict between biopolitics and economics. Secondly, contemporary compulsory metering programmes are positioned as a socio-technical fix where water companies have attempted to, at least partially, resolve a tension between water stress and household water demand and, at the same time, secure the continuation of the broadly neoliberal waterscape. Finally, the thesis examines the unanticipated effects of compulsory metering in reframing affordability as an important and immediate governance problem that requires private water companies to take on new roles, albeit reluctantly, as water welfare providers. These unintended outcomes of compulsory metering illustrate Foucauldian insights regarding the non-linear contingencies of government and highlight significant shifting boundaries between state and private companies with respect to water affordability.

The remainder of this introductory chapter provides a brief background to the water sector in England and Wales and puts the new compulsory metering programmes into the context of broader reforms occurring in the sector in the contemporary moment. This chapter then outlines the research questions that have been pursued and concludes by sketching out the structure of the thesis.

1.2 A brief introduction to the water sector in England and Wales

The model of privatisation of water services in England and Wales, full divesture, is almost unique, no country, other than Chile, has matched England and Wales in extent (World Bank, 2011). In 1989, the ten Regional Water Authorities (RWAs) that were created following the

1973 Water Act, and had operated along hydrologically drawn water basin boundaries, were floated on the London Stock Exchange having had all long term debt cancelled (Maloney and Richardson, 1994: 114; Ofwat, 2010a: 38). Importantly, water services in Scotland and Northern Ireland were not privatised and remained in public ownership. As a result, different legislative frameworks and systems of regulation are in operation across the UK.

Water companies in England and Wales are regulated by a combination of an economic regulator, Ofwat, the Environment Agency (EA), the Drinking Water Inspectorate and the Consumer Council for Water (CCW) (although the Welsh government has the opportunity to follow divergent policies under the devolution settlement).As demonstrated throughout the thesis, the economic regulator, the EA and the CCW, to differing degrees, have played an important part in contributing to compulsory metering being adopted and implemented in the South East of England. Comparatively, domestic water provision in Scotland is administered by publically owned water company that is accountable to the Scottish Parliament. Meanwhile, the water supply network in Northern Ireland is government owned and is accountable to the Northern Ireland Utility Regulator; however it operates largely as a private company (Tinson and Kenway, 2013).

In England and Wales, privatisation ushered in a different way of governing water, described by Bakker as a shift from 'state hydraulic' approaches to water governance to 'market environmentalism'. Here a system that loosely privileged social equity through water pricing was superseded by a way of thinking that sought to achieve the twin goals of economic efficiency, expressed through pursuing as close to full cost recovery as possible, and environmental sustainability through market based mechanisms. Here Bakker's (2004) much cited work on the re-regulation of the water sector has convincingly argued that water privatisation in England and Wales is best described in terms of complementary and co-existing processes of corporatisation, commercialisation and financialisation. In this context, water metering looked as if it would become a key tool in reordering the water charging system with the government initially seeking to ensure that a volumetric charging system would be put in place by the 1990s.

When the sector was privatised in 1989, the then government had announced that water companies would no longer be able to use rateable values to structure charges after the year 2000. Water companies would have to accelerate metering installation or design a new

unmeasured tariff. The water industry favoured water metering as a long term solution but argued that implementing metering before this date would be extremely costly (Bakker, 2004). Because the water industry deemed metering as a desirable yet, in the short term, unfeasible solution, an alternative unmeasured charging method was not developed. Instead, water meter installation rates limped slowly forward, rising by about two percent per annum as some households, often those who would gain financially from doing so, opted to take a meter. By 2009, around one third of households in England and Wales were metered and received a water bill based on the volume of water used.[1] The remaining two thirds of domestic water users were charged according to the rateable value of their home; rateable values were last updated in 1973 (see chapter five for greater detail).

1.3 25 years since privatisation: the shape of the waterscape

In 2014, almost twenty five years since the industry was privatised, the water sector now, in some ways, looks very different to the sector Bakker would have encountered. It is important to sketch out the shape of the sector in order to contextualise and situate the emergence of compulsory metering programmes within broader political and economic circumstances. At present the water industry is characterised by processes of deepening finanicialization as well as reforms designed to usher in greater marketization and a more customer focused service.

There are currently ten water and sewerage companies and a number of water only[2] providers (Figure 1). Through mergers and acquisitions, some water companies have changed hands multiple times since privatisation and patterns of ownership have shifted towards private equity firms. As Tinson and Kenway (2013) has observed, three ownership models have dominated the sector since privatisation in 1989. The majority, 68 per cent, of water companies were listed on the stock exchange until the mid-1990s; the remainder of water providers were private water companies or non-UK listed/based multinationals. Multinational ownership of water providers grew throughout the 1990s, peaking in 2000. Whereas over the

[1] Water bills comprise charges for water as well as for wastewater removal; wastewater services relate to water returned to public sewers. For metered households the wastewater element is calculated on the basis of the volume of water used by the household and an allowance is made for water used for drinking and in the garden. Southern Water, for instance, wastewater is charged for 92.5% of water used. For unmeasured households these costs are determined relation to the rateable value of the property. Not all companies provide sewerage services, these companies often bill for such services on behalf of other water providers.

[2] As the title suggests, water only companies do not supply sewerage services. Households supplied by a water only company receive their sewerage services from another company. Typically, household water users are issued with just bill for both services as the water only company tend to collect charges on behalf of the water and sewerage company.

last 13 years the situation has evolved so that now private equity consortia have acquired over half of water providers. The changes in ownership in England are important because these consortia are less transparent for they are not subject to the same disclosure rules as companies listed on the stock exchange.

Ownership patterns in England and Wales differ from the direction of trends elsewhere. For instance, Pigeon et al (2012) reason that there is an emerging trend towards 'remunicipalisation' in water governance, a transition between private to public provision of water services, where cites like Paris have declined to renew contracts with private companies for managing water services (see Lobina 2012 for an assessment of the factors that enable or prevent paradigm shifts in water governance). Some commentators have begun to question the extent to which trends in England are sustainable. For instance, Thames Water, a highly geared water company, has, according to Sir Ian Byatt, former Chief Executive of Ofwat, 'damaged its credit rating' and found itself in a position where it was unable to fund investment in its Thames Tideway sewerage project without government guarantees secured under the 2012 Industry (Financial Assistance) Bill (Byatt in Turner, 2013: 4). Key in this context is that the ratio of the industry's net debt relative to its assets (measures as Regulatory Capital) has increased from 30 per cent in 1996-97 of RCV to 70 per cent by 2009-10 (Tinson and Kenyway, 2013: 9, see Tables 1 and 2 for more detail). Debt in the sector has increased from zero to £8.2bn between 1989 and 1996-7 and from £8.2bn to £34.6bn between 1996-97 and 2009-10 which is a four-fold in real terms (ibid).

The water industry in England and Wales is currently undergoing another round of what Bakker might call re-regulation. Following a series of reviews on competition (Cave, 2009), regulation and consumer representation (Gray, 2011) and household charging (Walker, 2009), a number of reforms have either been introduced or planned that are intended to reorganise the regulatory practices at work in the sector in order to provide scope for 'market based approaches and voluntary approaches' (Defra, 2011a). Here two processes dominate, a struggle for deeper marketization, particularly through competition in the non-domestic market, and an aspiration to create a sector that is more consumer centric; debates surrounding metering must be considered in this context.

The 2014 Water Act will provide the legislative footing for the creation of a competitive non-domestic water sector for the first time in England and indicates an intention to implement

abstraction reform from the early 2020s and upstream market reforms which would, in theory, make it easier for new entrants to provide water in competition with incumbent water suppliers after the next price review period. More broadly, the regulatory framework has also been altered in preparation for the forthcoming price review process to facilitate these aspirations. Importantly, water companies are required to establish and consult a Customer Challenge Group throughout the development of their business plans for the forthcoming price review. These groups are independently chaired (often a CCW representative has acted as chair) and are comprised of customer representatives (for example CCW, Age UK, Citizens' Advice Bureau (CAB), Environmental bodies and local authorities). The hope is that if customers are involved in scrutinising the water company plans, companies are more likely to take steps to reflect customer views and priorities in their planning. If the regulator is satisfied that water companies have robustly engaged with water users, then the water companies' plan will receive less rigorous, lighter touch scrutiny from the regulator itself. In this sense the water sector is undergoing a new process of re - regulation that is characterised by dual processes of customer engagement and deepening marketization.

Figure 1 Water Companies in England and Wales

Key: AFW – Affinity Water; BRL – Bristol Water; CAM – Cambridge Water; CHL – Cholderton & District Water; DVW – Dee Value Water; ESK – Essex and Suffolk Water (part of Northumbrian Water); HPL – Hartlepool (part of Anglian Water); PRT – Portsmouth Water; SBW – Sembcorp Bournemouth Water; SES – Sutton & East Surrey Water; SEW – South East Water; SST – South Staffs Water (Ofwat, 2012).

Table 1 Water and Sewerage company ownership structure and gearing levels

Water Company	Gearing ratio debt to RCV (%)	Ownership
Anglian (Including Hartlepool Water)	79.5	Anglian Water Services Limited. Osprey Acquisitions Limited. Consortium of *pension funds*, *infrastructure funds* and *private equity* fund managers.
Dwr Cymru (Welsh Water)	65	Glas Cymru. Company by limited guarantee (no shareholders). *Trust Board*.
Northumbrian (including Essex and Suffolk Water)	63	Northumbrian Water Limited. Cheung Kong *Infrastructure Holdings Plc* (largest publicly listed infrastructure company in Hong Kong).
Seven Trent	58.4	Seven Trent Water Limited *Plc* (FTSE 100 company).[3]
South West Water	55	South West Water Services Limited. *Pennon Group Plc*.
Southern Water	79	Southern Water Services Limited. Consortium of *infrastructure* and *private equity*. Leading shareholders include JP Asset Management and UBS's International Infrastructure Fund. Other small shareholders include Cheung Kong Infrastructure.[4]
Thames Water	77.4	Thames Water Plc. Parent Company, Kemble Water. Majority owner, Macquarie an *infrastructure investment fund*. Other investors include *pension funds, private equity and sovereign investment funds* including the Abu Dhabi Investment Authority and the China Investment Corporation.
United Utilities	60	United Utilities Group Plc (FTSE 100 Company, largest remaining publicly quoted water companies in the UK).[5]
Wessex Water	63.6	YTL Utilities Limited. YTL Power International of Kuala Lumpur: *Private limited company.*
Yorkshire	60.8	Yorkshire Water Services Limited. Kelda Group which was acquired by Solitaire Water in 2007: consortium of *HSBC, Citigroup Prudential* and *GIC Special Investments of Singapore.*

[3] Rejected a takeover bid from a overseas consortium, LongRiver, in June 2013
[4] Around 5 per cent of the holding is expected to change hands in the near future.
[5] There has been speculation that United Utilities would be targeted for a takeover bid in 2013.

Table 2 Water only company ownership structure and gearing levels

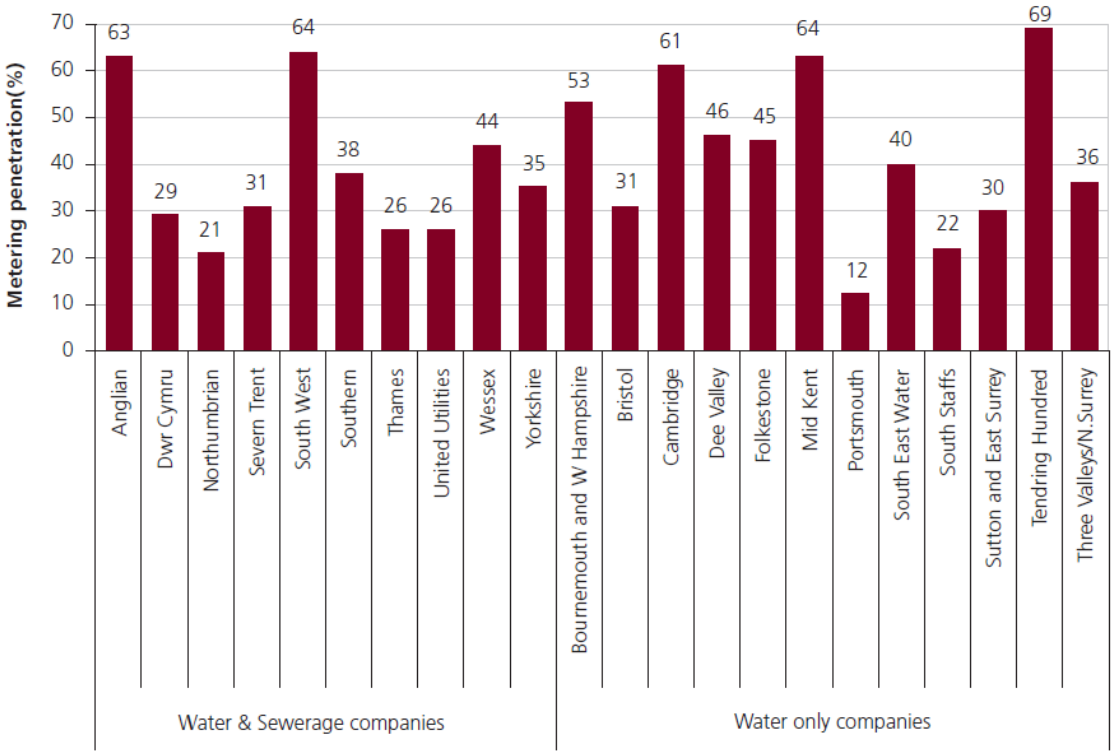
Water Company	Gearing ratio debt to RCV (%)	Ownership
Affinity Water (all regions)	77	Limited company owned by Morgan Stanley and M&G Investments.
Bristol Water	62	Bristol Water plc. Owned by Capstone Infrastructure Corporation (50 per cent), Sociedad General de Aguas de Barcelona (Agar) and Itochu Corporation of Japan (20 per cent).
Dee Valley	66	Dee Valley Water Group *plc*.
Portsmouth	77.9	South Downs Capital Ltd and Star Capital Partners Limited.
Sembcorp Bournemouth	60.5	Dee Valley Group *Plc*.
South East Water (including mid Kent)	62.8	South East Water Plc. Utilities Trust of Australia *investment fund* Caisse de depot et placement du Quebec (CDPQ) *Pension Fund.*
South Staffordshire (including Cambridge)	73.2	South Staffordshire Plc, Alinda Infrastructure Fund – made up of largely *pension funds*.
Sutton and East Surrey Water	76	Sutton &East Surrey Water Plc's holding company was acquired by the Japanese company Sumitomo Corporation who sold half of its holding to Osaka Gas Co.

Although around one third of households were metered by 2009, the rate of water meter penetration differed substantially across England and Wales (see Figure 2). Some companies had high meter rates, for instance 64 per cent of South West Water's customers were metered as households have attempted to stave off high unmeasured charges levied by SWW; this company's bills were 43 per cent higher than the average due to the unanticipated extensive investment the company made in order to meet European Directives regarding the quality of the beaches in South West England (Walker, 2009). Anglian Water also had a high meter rate due to its proactive stance in encouraging households to opt for metering. Meanwhile other companies had much lower meter rates; for example just 12 per cent of Portsmouth Water's

constituency were metered, while 26 per cent and 21 per cent of Thames Water and Northumbrian Water's customers were metered respectively.

In this context, 2009 marked an important moment for the water industry. While some companies had previously embarked on small, targeted compulsory metering programmes (see Knamiller and Sharp, 2009), 2009 was the first time that plans for compulsory, companywide metering were given regulatory approval. Here metering was considered to be a vital tool necessary to achieve two main goals. First, the meter was positioned as important in helping to address the supply and demand balance in water stressed areas and, secondly, in creating a fairer water charging system.

Figure 2 Water meter penetration 2008 - 2009 (Walker, 2009: 31)



Water availability is a particularly acute in the South East of England. According to the EA there is 'less water per person in South East England than in many hotter, drier countries such as Morocco and Egypt' (EA, 2008a: 10). The water meter was perceived to be important in helping to realise the government's aspiration of reducing per capita consumption (PCC) to

130 litres per day by introducing financial incentives to reduce water use (Defra, 2008).[6] According to the Climate Change Adaptation Sub-Committee, the (2012) average PCC in England is 145 litres a day; this has fallen from 150 litres per day in 2000 (Climate Change Committee Adaptation Sub-Committee, 2012: 66). This average figure masks considerable regional differences in PCC figures, regional averages 'vary significantly from around 110 to 185 litres per day' (ibid). The highest rates of consumption, according to the EA, are found 'in several water supply area in the South East of England where household water use for unmetered properties is more than 170 litres per day' (EA, 2008a: 11). The EA also reported that on average, people in metered households used 13 per cent less water than those in unmetered homes although it is unclear as to whether this difference should be attributed to a change in how water is used at home, changes in building codes or white goods making them more efficient or better detection of leaks (ibid). In addition to addressing water stress, the companies undertaking water metering emphasised that meters could be used in order to establish a fairer water charging system.

Debates about fairness in the water sector are timely and particularly important due to rising water bills and broader concerns about the rising cost of living (Hirsch, 2013). Water bills have trebled between 1989-90 and 2013-14 whereas, over the same period, inflation has doubled meaning that water bills, on average, have increased by 50 per cent in real terms since privatisation (Tinson and Kenway, 2013: 7). Despite the potential for metering to negatively influence the cost of living for some households, the relationship between metering and affordability was not interrogated when the compulsory metering plans in South East England were approved (Boyland, 2010).

The experience of metering in South East England could influence the way that metering, in the future, is implemented in other parts of the country. The 2009 Walker *Independent Review of Charging for Household Water and Sewerage Services* endorsed moving to a metered charging basis in the long term, although it did not advocate universal compulsory metering on a national scale, it did recommend metering 80 per cent of domestic properties in England and Wales by 2030. Therefore, the experience in the South East of England could help shape future approaches to metering elsewhere in England and Wales. Consequently, the

[6] This policy aspiration was set by the previous Labour government, however the present Conservative led Coalition government has not altered course.

ways that metering might contribute to negotiating different waterscapes and influence how water and water users are governed demands close attention.

1.4 Research Questions

This thesis explores the political ecology of compulsory water metering in South East England. As indicated at the beginning of this chapter, water metering has the potential to radically transform how domestic water users access water in South East England. This thesis explores the ways that water and water user are governed through compulsory water metering. In this context, the thesis examines the extent to which the introduction of compulsory metering in South East England undermines, challenges or reproduces the broadly neoliberal waterscape in England and Wales. Subsequently, the thesis asks three main questions:

1. How and why have compulsory water metering programmes emerged, from the perspective of some water companies and stakeholders in the sector, as desirable interventions in South East England?

2. How has the introduction of compulsory metering influenced the ways in which water and water users are governed in the South East of England?

3. What, if any, unintended outcomes have resulted from the introduction of compulsory metering in South East England?

1.5 Structure of thesis

In responding to these objectives, the thesis is structured as follows. The next chapter reviews literature on governmentality and historical materialism to explore gaps in existing literature and consider ways that these bodies of literature might assist in developing a framework for better understand socio-technical change brought about in and through compulsory metering in South East England. The chapter argues that together these bodies of literature can provide a framework that is capable of capturing the messy, dynamic processes whereby compulsory metering emerges as a desirable policy intervention and influences the governance of water and water users.

The third chapter then provides detail on the methodological approach and tools used to collect, analyse and communicate findings from the empirical resources utilised in the thesis. It establishes links between the qualitative methods used and the literature review provided in the previous chapter. Finally, it highlights some of the challenges encountered throughout the research process.

Subsequently, chapters four to seven take up objectives one to three in turn. Chapters four and five contribute to building a genealogy of metering in England and Wales from 1840 to 2009. These chapters demonstrate the multiple ways that the meter, as a technology, has been used to help negotiate different understandings of the waterscape over this time period; through this genealogical approach the chapter also examines how and why compulsory metering became a desirable policy approach in the contemporary moment.

Chapter six then focuses on how compulsory water metering programmes influence how water and water users are governed in South East England. This chapter draws specifically on governmentality approaches and Harvey's work on 'moments' (see chapter two) to examine the ways that metering contributes to renegotiating the waterscape. Overall, this chapter argues that compulsory metering has deployed as a socio-technical fix that seeks to, at least partially, address tensions regarding water stress and perceived profligate water use in a way that secures the broadly neoliberal shape and form of the sector.

Subsequently chapter seven, focuses on an unanticipated outcome of compulsory metering; the repositioning of water companies as, at times reluctant, water welfare providers. Here the chapter focuses on the relationship between water metering and affordability; an issue that was initially overlooked in the design of the compulsory metering programmes. It argues that companies have introduced important new schemes to mitigate against affordability problems caused by water metering yet the solutions proffered are not designed to fundamentally tackle broader affordability problems in the water sector. Significantly, these new measures have the effect of stretching the role of water companies and reshaping the corresponding responsibilities of the state and private water provider in delivering forms of water welfare. In turn, this has profound implications for understandings the respective role of the state and private water provider in governing the waterscape.

Finally, chapter eight summarises the main findings of the thesis, highlights the key contributions that the thesis offers and offers some avenues for future work which would build on the work contained in this thesis.

2 Literature Review: Society, Technology & Nature

2.1 Introduction

This chapter develops a theoretical framework for better understanding how compulsory metering has emerged, from the perspective of some companies, as a desirable policy and for examining how the meter has contributed to negotiating and renegotiating the waterscape. It builds on Drakeford's (1998) excellent work on prepayment metering, Trentmann and Taylor's (2005) research on the relationship between metering and consumer culture and Knamiller and Sharp's (2009) work on metering and trust in Kent. This chapter draws on Foucault's work on governmentality and historical materialist insights on the production of nature, particularly Harvey's work on moments, to develop a theoretical framework appropriate for theorising the messy, dynamic processes whereby water and water users are governed through water metering. This framework is vital for examining how and why contemporary compulsory schemes have emerged and exploring the extent to which these schemes have sparked a substantial shift in how water and water users are governed in South East England.

The chapter begins by examining Foucauldian understandings of biopolitics and governmentality in relation to environmental governance. It then moves to evaluate historical materialist work on the production of nature and Harvey's work on moments. Subsequently, the chapter explicitly discusses water metering in relation to notions of fairness. The chapter concludes that although Foucault's work on governmentality and Harvey's framework of moments, do not fit together neatly, these two approaches are crucial for better understanding how the waterscape is reproduced in the South East of England.

2.2 Foucault and the art of government

In 2003 Castree reported that very few Geographers employed governmentality approaches. However, over the last decade, following the recent translation and publication of Foucault's lectures at the Collège de France into English, engagement with Foucault's work has become prevalent in wide range of studies including water governance (Bakker, 2010; Ekers and Loftus, 2008; Smith and Ruiters, 2006). Foucault himself did not express a strong interest in how nature, or the environment, becomes governed, or how populations are implicated in that

process. In fact, Rutherford reports that Foucault 'indicated a definite distaste for it' (Rutherford, 2007). Nevertheless, Scholars have drawn on Foucault's ideas surrounding biopolitics (Joyce, 2003; Osborne, 1996, Bakker, 2012), governmentality (Agrawal, 2005; Elden, 2007; Legg, 2005) and genealogy (Gandy, 2003) to explain how environments and populations are governed. Gordon's representation of biopower as 'the conduct of living and the living' also suggests that there is scope within Foucault's position to examine the processes of governing both human and non-human natures (1991: 8). In the context of rapid growth of studies inspired by Foucault's work, Philo (2012) has noted that Geography is now far from 'Foucault-lite' (p.496).

2.3 Foucault and Biopolitical[7] problems

Foucault's work on the art of governing was initially framed through the concept of biopolitics; a notion engaged with throughout his *Society Must Be Defended* lecture series in 1976 (Foucault, 2003) and in *The History of Sexuality* (Foucault, 1980).[8] Biopolitics provided the theoretical foundations for Foucault's work on governmentality and, broadly, can be defined as referring to the 'art and the styles of governing' (Rutherford and Rutherford, 2013a: 413). Nevertheless, there is more than one way to understand biopower (Rutherford and Rutherford, 2013a). Indeed, Foucault uses the term biopolitics in three ways: to describe a historical rupture in political thinking and practice that is characterised by a rearticulation of sovereign power', to understand the 'rise of state racism' and as a 'distinctive art of government that historically emerges with liberal forms of social regulation and individual self-governance' (Lemke, 2011a: 34). What unites the three variants is Foucault's enduring 'investigation of the practices of governance in modern times' (Rutherford and Rutherford, 2013a: 412). While Foucault was imprecise in his use of the terms biopower/biopolitics, Rabinow and Rose have suggested that biopolitics is best as expressed as 'the specific strategies and contestations over problematizations of collective human vitality, morbidity and mortality; over the forms of knowledge, regimes of authority, and practices of intervention that are desirable, legitimate and efficacious' (2006: 197). Accordingly, biopolitics is, as Rose and Miller outline, a 'problematizing activity' where particular problems are made visible and intervention in governing these problems becomes legitimised

[7] Foucault used the terms biopolitics and biopower interchangeably.
[8] Strangely the series *The Birth of Biopolitics* gave scant attention to the notion of biopolitics despite the term featuring prominently in the title of the collection of lectures.

and intelligible (2008: 61). In this context, one of the main things that distinguished Foucault's concept of biopower from other ways of governing is the perceived locus of the object of government.

Key to Foucault's notion of biopolitics was his focus on *population* as the primary object of governance as opposed to territory. Through the lens of social medicine, he described the process whereby 'old fashioned' ways of governing through discipline and sovereignty were being increasingly complemented by governmental efforts to optimise the health and wellbeing of the population (Rutherford and Rutherford, 2013a). This did not mean, as Agamben (1998) has claimed, that sovereign power completely disappeared in Foucault's analysis. Foucault's notion of biopolitics 'focused on the management of each and all, of things as well as people, by the state and by private agents' (Rutherford and Rutherford, 2013a: 413). In this context, Foucault was interested in charting:

The attempt, starting from the eighteenth century, to rationalise the problems posed to governmental practice by phenomena characteristic of a set of living beings forming a population: health, hygiene, birth rate, life expectancy, race (Foucault, 2008: 317).

Geographers, especially those working on water, now engage with Foucauldian notions of biopolitics in a more direct fashion (Bakker, 2010; Gandy, 2004b; Scholesse, 2008; Smith and Ruiters, 2006). For example, Bakker has recently stated that 'the way we use and relate to water is quintessentially biopolitical' (2012: 619). She argues that there is a link 'between the constitution and consolidation of political and economic power, on the one hand, and the control of socio-natures, on the other' (Bakker, 2012: 620). Here, Foucault's concept of biopower provides the beginnings of a useful framework for analysing environmental and public health services such as water because it encourages exploration of how 'modern governments seek to optimise both water resources and individual water-use practices in order to secure the health and productivity of the population' (Bakker, 2012: 619). The thesis builds on work on biopolitics by identifying how, over time, different governmental problems relating to water are made intelligible and by examining how the meter has been deployed to intervene in and address these biopolitical problems. Chapters four and five trace how the meter has been used in an attempt to manage a wide variety of biopolitical problems, for example ensuring universal supply, managing perceived profligate use and the water stress. These two chapters explore how the meter has been used to help express what is understood

as a “fair” waterscape (see below for a discussion of fairness in relation to water metering). Meanwhile, chapter seven explores how metering interventions can also result in the emergence of unanticipated biopolitical problems, in this case affordability, which can, in turn, lead to important transforms in the configuration of the waterscape.

Work on biopower/biopolitics throws up a wide array of questions surrounding what kind of governmental problems are identified and what type of strategies and techniques are employed by modern states to tackle them and secure the vitality of its population. While important, Foucault did not entertain a sustained engagement with biopolitics as a concept. Instead he moved swiftly to develop some of these ideas through the notion of governmentality.

2.4 Governmentality: The Conduct of Conduct

Foucault described governmentality as an ‘ugly word’ and described his work on this concept as an ‘extremely vague sketch’ that was ‘not finished work’ but a series of ‘possible tracks’ that could be taken up in later research projects (Foucault, 2008: 115). The term governmentality is derived from the French adjective gouvernemental and, according Brockling et al, ‘already had some currency before Foucault made it into a central concept in his work’ (2011:1). Although there are differences of interpretation, the definition of government within Foucault’s governmentality thesis is generally understood as ‘the conduct of conduct’ which refers to governing the self *and* to governing others (Huxley 2007: 186; Lemke 2001; 2002). Despite the absence of a complete theory and a published monologue on the topic, the two volumes of lectures in 1978-9, where Foucault explores the notion of governmentality, have proved hugely popular since the mid-1990s (Huxley, 2007: 192). It is important to note that although governmentality is often interpreted as a ‘major intellectual change in direction’ in Foucault’s work, focus on governmentality should be read as a development rather than a break in his oeuvre. Foucault’s account of governmentality complemented, yet did not supplant, his previous analyses of disciplinary power by considering seemingly less abrasive techniques and instruments for governing populations (Jessop, 2007: 37; also see Crampton and Elden, 2007).

Over the last two decades, Foucault's 1978 lecture 'on governmentality' at the Collège de France, the fourth lecture in his *Sécurité, Territoire, Population* series, has influenced a vast

array of geographers engaged in policy critiques and studies concerning the re-articulation of governance over the self and over others (Burchill, 1996; Dean, 2004; Crampton and Elden, 2007; Huxley, 2007). In this context, Jessop claims that there are a number of academics, loosely grouped under the umbrella of 'governmentality studies', who 'do not aim to be Foucault scholars but selectively apply his initial insight on governmentality to new areas' (Jessop, 2011: 58). Such an approach, Jessop argues, rests on a 'narrow understanding of governmentality and resulting neglect of its place in Foucault's intellectual and political reflections' (ibid). Here Jessop is referring to the emphasis governmentality studies have placed on micro techniques of governance without locating these insights among broader changes in patterns of governance on a macro scale. Foucault's own reflections on governmentality, which focus on the 'analytics of government', require consideration of ways of governing across multiple scales as he defines government as being 'the conduct of conduct' and thus encompasses both the way of 'governing the self' as well as broader processes of 'governing others' (Lemke, 2011a). This dual emphasis is useful for thinking about water metering as a strategy of governance. It gives scope for analysing how water and water users are, collectively and individually, governed in and through metering as well as how water users take up or resist calls to alter the way they use water. Chapter six explores these issues in greater detail.

2.5 The art of governing: statecraft and state effects

Foucault is quite clear that he initially conceived the concept of governmentality as a lens for analysing how different forms of governing, particularly representations of the state, emerge and are sustained. During the fifth lecture of the Security, Territory, Population series, after apologising for being ill, he posed a hypothetical question; 'why should one want to study this insubstantial and vague domain covered by a notion as problematic and artificial as that of "governmentality"?' (Foucault, 2009: 116). To which he re-joined: 'my immediate answer will be, of course, in order to tackle the problem of the state and population' (Foucault, 2008: 116). Here Foucault, took a position that is congruent with many Marxist thinkers, he refused to take 'the state' for granted and does not offer an all-encompassing theory of the state that is ahistorical, essential, universal and stable. Instead he explored how particular understandings and expressions of the state become crystallised in certain conditions and at particular times. As Jessop notes, Foucault argues that the state is constituted 'in and through interrelated changes in technologies of power, objects of governance, governmental projects,

and modes of political calculation' (2007: 36). In this sense, the concept of governmentality is a way of reflecting on the historical constitution of forms of governing and how these forms of governing stabilise or change (Lemke, 2001: 6). Accordingly, as Rose and Miller indicate, the governmentalized state 'can be seen as a specific way in which the problem of government is discursively codified' and as a 'way in which certain technologies of government are given a temporary institutional durability and brought into particular kinds of relations with one another' (2008: 177). Or, as Jessop offers, governmentality relates to the study of 'the historical constitution of different state forms in and through changing practices of government' (2007:37). In this sense, in Foucault's words, the governmentalized state should be understood as an:

[E]nsemble formed by institutions, procedures, analyses and reflections, calculations and tactics that allow the exercise of this very specific, albeit very complex, power that population as its target, political economy as its major form of knowledge and apparatuses of security as its essential technical instrument (Foucault, 2009: 108).

Governmentality is, therefore, the relational study of particular regimes of truth and modes of governance that 'influence the assemblage of particular devices for exercising power and intervening upon certain problems' (Huxley, 2007: 187). Accordingly, for Foucault, the state is understood as a 'relational ensemble' (Jessop, 2007:36) where 'multifarious' practices of government operate (Foucault, 1979: 93). In these lectures Foucault explored the emergence of different forms of governing from the 15th century including the emergence of German liberalism following World War II and Chicago School neoliberalism. Throughout this work Foucault was concerned with the emergence and consolidation of specific ways of governing populations or, in other words, 'the history of the present' (Dreyfus and Rabinow, 1982: 119; O'Farrell, 2005; Roth, 1981). He considered questions, or problems, of public health and policy to be 'inseparable from the framework of political rationality within which they appeared' (Foucault, 2008: 317). In this context he was interested in questions surrounding how populations could be 'taken into account', what implications this would have for understandings of freedom and 'in the name of what and according to what can it [the population] be managed' (ibid). Here Foucault's approach emphasises that ways of governing, including compulsory water metering, are not ahistorical. His work provides useful tools for analysing the emergence of different ways of governing over time and for

exploring how compulsory water metering, as a technique of governance has materialised, from the perspective of some water companies, as a desirable and legitimate policy.

2.6 Government of the Self

There is, as referred to above, a second way in which governmentality can be applied. In addition to being concerned with overarching governing rationales, Foucault was also interested in processes of self-government. It is this element of Foucault's analysis that has been taken up most popularly amongst those operating within the loose field of governmentality studies. Foucault's interest in self-government represents a significant, yet not absolute, shift in Foucault's oeuvre. As Lemke (2002) reveals, Foucault seeks to 'corrects the findings of his earlier studies in which he had investigated subjectivity primarily with a view to "docile bodies" and had too strongly stressed the processes of discipline' (Lemke, 2002:4). Through his work on governmentality, he examines processes of self-government or, as Foucault describes it, 'technologies of the self' (Foucault, 1988). In this sense, as Lemke (2001) describes, governmentality 'refers to a continuum, which extends from political government right through to forms of self-regulation' (Lemke, 2001: 201).

Scholars have found Foucault's concept of governmentality, with its dual focus on tracing the emergence of forms of rule and the diverse processes of subjectification, useful for investigating how populations are "managed" within a 'new discourse of ecological scarcities, active citizenship and the commodification of nature' (Ruiters and Smith, 2006: 192). Academics from a range of disciplines have applied Foucauldian approaches to agency, power and responsibility to environmental issues in neoliberal societies (Agrawal, 2005; Hobson, 2013). Studies have shown how technologies of government, such as surveys, have been used to create particular discursive understandings of the environment, make environments intelligible and shape the roles and responsibilities of individuals. For example, Patterson and Stripple (2010) and Rutland and Aylett (2008) have analysed the ways that different technologies of carbon accounting are used to produce 'responsible carbon calculating' citizens. In these studies Foucauldian analytical tools have been fundamentally important in revealing how particular environmental truths have emerged in neoliberal regimes and how forms of subjectivity have been transformed in order to 'make governance work' (Raco and Imrie, 2000: 2195). In the context of water governance, this involves exploration of how the conduct of water users is "managed" as well as the water users'

‘relations with the material world, customs, beliefs and ways of acting and thinking’ (Ekers and Loftus, 2008: 702). These studies have often concluded that, in different systems of neoliberal governance, responsibility for environmental problems tends to be ‘laid firmly at the door of individuals’ who ‘must make different purchasing decisions if environmental problems are to be solved’ (Hargreaves, 2011a: 319).

With water metering specifically, most academic studies have explored programmes that target low income communities (Drakeford, 1998; Loftus, 2006; Ruiters, and Smith, 2006 and Von Schnitzler, 2008). Here Foucault’s ideas surrounding regulation, surveillance and internalised forms of self-policing have proved useful for investigating some of the nuances of water metering policies. Studies using governmentality approaches have analysed how metering has contributed to producing particular, largely neoliberal, understandings of the waterscape and shaping the conduct of water users in ways that are complementary to neoliberal ideas. Foucauldian insights have proved especially relevant where metering programmes are designed to, and in some circumstances have led to, greater self-regulation of water use and deepening understandings of water as a commodity (Ruiters and Smith, 2006). For example, Deedat and Cottle (2002), as well as Ruiters and Smith (2006), have used Foucauldian approaches to expose how controversial pre-paid meters have been deployed in South Africa to bring into being ‘calculative citizens’, who are expected to carefully calculate and economise their water use. Here water users are encouraged to become more “responsible” consumers. Similarly, Von Schnitzler (2008) has shown that pre-paid meters can place additional disciplinary burden on low income households, normalise explanations for non-bill payment as a ‘culture of non-payment’ rather than an inability to pay and produce a culture of mistrust (2008: 912-13, also see Harvey, 2005). Similarly, Loftus (2006) has shown, though he does not directly engage with governmentality, that the introduction of metering, as well as trickle flow meters, imbues a calculative ethos that places additional burden on low income households and regulates the patterns of their everyday interactions with water. The compulsory company-wide metering programmes underway in South East England are very different to the programmes that specifically target low income households. Nonetheless, similar questions remain significant regarding how the conduct of water users is shaped through compulsory metering programmes.

2.7 The space of government

Foucault's conceptualisation of the state as a relational ensemble, and governmentality as the art of governing, calls for close attention to be paid to the multiple actors that exercise a governing role. Here Foucault's work provides inspiration for the study of what Andrew Barry (2001) calls 'the space of government'. Debates about water governance, particularly in relation to the commercialisation and privatisation of water delivery supply systems, are often framed in terms of the retreat of the state (Bayliss & Fine, 2008; Bakker, 2004). Painter notes that 'despite long-standing calls to rethink the state "as a social relation", reified understandings that view the state as a differentiated institutional realm separate from civil society are notably persistent in academic and political debate' (2006: 752, also see Bulkeley and Schroader, 2012). Similarly, Barry suggests that, 'traditionally, the space of government has been conceived in terms of a relation between a national population and a national territory' (2001:3). However, using a Foucauldian approach, Barry argues that government operates in spaces beyond those commonly associated with traditional understandings of the state. He asserts that 'government operates not just in relation to spaces defined and demarcated by geographical or territorial boundaries but in relation to zones formed through the circulation of technical practices and devices' (ibid). Government is, then, understood as being 'accomplished through multiple actors and agencies rather than a centralised set of state apparatuses' (Dean, 2004:26). As Ruiters and Smith (2006) suggest, this understanding of government is useful for analysing the space of water governance, especially in respect to 'analysing the relational dynamics within a decentralised context for [water] service delivery' (p. 192). This is because it facilitates analysis of governance beyond the "traditional" space of government to consideration of utility companies, meters, ideas, regulators, consumer advocacy organisations and other actors active in the water industry. As Rutherford claims, governmentality helps to 'de-center the state as a seat of power: power bleeds across the social body in such a way that governing occurs in multiple sites and through a myriad of techniques' (Rutherford, 2007: 294). Chapter seven builds on these ideas by exploring how the roles of different actors have changed as the sector seeks to tackle affordability problems caused by the introduction of compulsory metering. Extending the role of the private water company to encompass responsibilities for aspects of social welfare raises important implications regarding how the role of the state is understood in relation to water governance.

2.8 Multiple contemporary governmentalities in England and Wales

If the state is not a coherent, static entity but is, as Foucault describes, in effect 'nothing more than the mobile effect of a regime of governmentalities' (Foucault, 2007: 36), the question then becomes what governmentalities are at work and, in turn, how do they shape the practice of governing? Building on Foucault's work, geographers have considered the extent to which neoliberalism can be understood as a form of governmentality (Larner, 2000 & 2007). This section focuses on three 'governmentalities' that have framed the art of government in England and Wales: 'market environmentalism', 'liberal paternalism' and 'the Big Society'. Together these multiple governmentalities have been hugely influential in shaping debates surrounding compulsory water metering programmes in South East England.

In relation to water governance in England and Wales, Bakker (2004) has convincingly characterised shifts in governance approaches as a process of re-regulation. Most significantly, she has argued that the techniques for governing and managing the waterscape have shifted from a 'state hydraulic' paradigm, prevalent up until the 1970s, to one of 'market environmentalism'. Although neither approach is monolithic and, as such, materialise in different forms in particular places, there are common themes that distinguish the state hydraulic and market environmentalist approaches. Importantly, the two approaches are marked by different patterns of reasoning and are constituted of contrasting regimes of truth as well as differing governing techniques and technologies. Regarding the state hydraulic approach, Bakker explains that it was:

Predicated on an assumption of abundant water supplies, this paradigm emphasised the deployment of hydraulic technologies to meet the inevitable growth in water demands engendered by modernisation. A commitment to social equity and universal provision necessitated significant government regulation, government ownership, and/or strict regulation of water resources development and water supply provision. This was in line with prevailing arguments in favour of recognised advantages of government provision, both political (such as democratic accountability and a commitment to public well-being) and technical (the relative availability of fiscal resources and the ability to collect and synthesize complex information) (Bakker, 2010: 31).

In England and Wales a state hydraulic approach, or what the former head of Ofwat Ian Byatt (2004) has described as 'water socialism', constituted of policy decisions that privileged engineering new sources of supply over demand management approaches. Reservoir development was preferred over technologies such as metering. The ultimate policy aim was to ensure universal access to affordable supplies of water. Here Herrington (1974, 1982) has noted that engineers, rather than economists, were prominent in influencing the direction of policy. In contrast, market environmentalism is characterised by three processes:

The privatisation of resources, the commercialisation of environmental management, and the liberalisation of governance (Bakker, 2010: 38).

Through the process of market environmentalism, according to Bakker, concern with social equality through redistribution was superseded by achieving positive environmental outcomes alongside economic efficiency (Bakker, 2004). Fundamental to 'market environmentalism' is the understanding that water, is best conserved, managed and regulated according to market driven governance methods (Bakker, 2010; Roberts, 2008). In this context, demand management strategies such as metering and cost recovery pricing structures took precedence over supply side measures such as reservoir construction. Shifts to market environmentalism can, therefore, be interpreted as a mode of re-regulation that views 'markets as the solution rather than the cause of environmental problems' (Bakker, 2005, also see Smith, 2008). The difficulty, however, is that while claiming to provide a solution to environmental problems, deregulation and commercialisation has, in some situations, contributed to further problems, for instance the production of greater environmental risk (Prudham 2004). This thesis builds on Bakker's work, and takes it in new directions by analysing the struggles that have been had, and remain, over metering, and by exploring the experiences of water users who are exposed to water metering technologies.

In doing so this thesis constructs a genealogy of metering (in chapters four and five) that examines the way that the meter has been utilised in England and Wales to negotiate different understandings of the waterscape from the Victorian period to the present. Moreover, the thesis identifies and explores the multiple governmentalities, namely liberal paternalism (chapter six) and the Big Society (chapter seven) that, in addition to market environmentalism, have frame how the waterscape has been reproduced in the context of contemporary compulsory metering programmes. The former provides insight into how the

meter has been deployed as a means to influence the way water users engage with water while the latter helps explain how the 'state' has been reconfigured through the metering programmes underway in South East England.

As discussed above, existing scholarship has revealed how water meters have been used to discipline water user behaviours and, in particular, to work up a type of environmental citizen-consumer that fits neatly with the neoliberal principles that shape the waterscape. Contemporary compulsory metering programmes use less draconian means and instead seek to engage in domestic users' everyday interactions with water through techniques such as behavioural economics.

2.9 Governmentality and liberal paternalism: structuring 'choice', nudging behaviour

Recently a collection of geographers have identified a new, or at least altered, governmentality at work in the UK (as well as the US); behavioural economics has become an influential discipline in the water sector and in UK policy circles more broadly (Hausman and Welch, 2010: 123; Huxley, 2011; John et al, 2011; Jones et al 2011a; 2011b). Although the meanings and expressions of behavioural economics are plural and hybrid, these scholars argue that the influence of Thaler and Sunstein's (2009) international bestseller *Nudge: improving decisions about health, wealth and happiness* in policy circles represents a particularly important shift in ways of governing. Thaler and Sunstein have exerted considerable influence over governments in both the US and UK. Indeed, the relationship between the Conservative Party and Thaler was so intimate that Wilby, writing in the New Statesman, 'went as far as to say that Cameron had found his philosophical guru in a similar way to how Blair had found Giddens and Thatcher had found Von Hayek' (in Jones et al, 2013:2).[9] A number of different government departments have used behaviour change interventions in sustainability programmes, active travel projects and youth reoffending schemes (Cabinet Office et al, 2011: 6; also see Defra 2007). Moreover, on coming into power in 2010 Cameron established the Behavioural Insights Team, colloquially referred to as the 'Nudge Unit', at a reported cost of £520 000 per annum (Malik, 2013). The Nudge Unit has been deemed such a success that the government opted to mutualise it, turning it into

[9] For an excellent review of the emergence of liberal paternalism in UK policy making, see Jones et al, 2013.

a ‘profit making joint venture with private companies being invited to bid to make up 50 per cent of the new business’ (Mayo, 2013).

In their 2009 volume, Thaler and Sunstein identify a series of problems with classical economics and introduce what they refer to as their ‘new movement’, ‘libertarian paternalism’ (2009: 5). Most importantly, Thaler and Sunstein argue that the concept of the rational economic man does not hold up to scrutiny. In this sense nudge appears to be in tension with some aspects of the neoclassical and neoliberal tradition. Thaler and Sunstein reject the notion that ‘almost all people, almost all of the time, make choices that are in their best interest or at the very least are better than the choices that would be made by someone else’ (2009: 10, also see Jones et al, 2013:18). As Jones et al note, ‘Thaler and Sunstein argue that many of our choices require some form of rationalised re-design’ (Jones et al, 2013: 28). In this context libertarian paternalism is presented as ‘a real Third Way – one that can break through some of the least tractable debates in contemporary democracies’ (2009: 253). Accordingly, Thaler and Sunstein describe liberal paternalism as a compromise that seeks to maximise individual freedom yet also acts in a paternalistic fashion by actively shaping environments so individuals are more likely to make choices that benefit them and society as a whole. Here policy makers are referred to as choice architects. Overall, Thaler and Sunstein offer libertarian paternalism (which from now will be referred to as nudge) as:

A relatively weak, soft, and nonintrusive type of paternalism because choices are not blocked, fenced off or significantly burdened. If people want to smoke cigarettes, to eat a lot of candy, to choose an unsuitable health care plan, or to fail to save for retirement, libertarian paternalists will not force them to do otherwise – or even make things hard for them. Still, the approach we recommend does count as paternalistic, because private and public choice architects are not merely trying to track or implement people’s anticipated choices. Rather, they are self-consciously attempting to move people in directions that will make their lives better. They nudge (2009:6).

Following this line of thought Thaler and Sunstein define a nudge as:

Any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count

as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting the fruit at eye level counts as a nudge. Banning junk food does not (2009: 6).

In this sense, nudge has, to an extent 'altered the logic of policy' and, as Bradbury et al neatly put it, has led to 'a new balance between two opposing logics of freedom and control... this new logic seeks to combine freedom of choice with the control of that choice, a paternalist obligation to help individuals make better decisions' (2013: 263). Liberal paternalism with its focus on non-rational decision making and focus on freedom, 'can be seen as a contemporary twist on the long-standing general dilemma for liberal government of how to induce appropriate conduct among free subjects' (Pykett et al, 2011: 304, also see Bell, 1996; Huxley, 2011). In this context, Wikins (2013) argues that choice architects tend to make a distinction between the 'rational' and 'emotional' decision making and target the latter as the 'particular sites, relations and practices… of government intervention' (Wilkins, 2013: 5). Similarly, Bradbury et al (2013) describe nudge as a 'revised rationality', claiming that 'it is a subtle adjustment, a revision of the conception of the subject' that 'envisages a different subject of policy and a different policy-making subject than neoclassical economics' (p. 252-253).

Importantly, this does not mean that Thaler and Sunstein's work on nudge, and behavioural politics more generally, should be read as a complete departure from neoliberalism. As Jones et al (2013) emphasise, 'despite finding its origins in opposition to classical economic thought and the emerging neoliberal tradition, care must be taken not to draw too strong a line of distinction between behavioural economics and neoliberalism' (ibid, p. 10). This is because what counts as 'rational' conduct, and its links to freedom, has been long contested. For instance Becker's (1962) work on extending rationality and economic analysis to 'non-economic' fields was challenged by Foucault, in *the Birth of Biopolitics*, who argued that Chicago School neoliberalism had incorporated both rational and non-rational elements of human behaviour (Foucault, 2008: 267-271; Huxley, 2011; Jones et al, 2013). Foucault also emphasised how notions of freedom are 'constantly produced', he argued that 'liberalism is not an acceptance of freedom; it proposes to manufacture it constantly, to arouse and produce it, with of course [the] constraints and the problems of cost raised by this production' (Foucault, 2008: 65 in Huxley, 2011:303). Therefore, as Bradbury et al convincingly explain:

It is important to note that we are by no means claiming that there is taking place some kind of epochal shift away from the rational subject within policy, and thus away from liberalism. 'Liberal paternalism' has not supplanted or replaced neoliberal policy-making. In fact, it is a key to understanding the nature and operation of 'nudge' that it does not do so. This is not a radical discontinuity in the goals and modalities of neoliberal policy-making (Bradbury et al, 2013: 253).

Rather than perceiving the advancement of nudge as a complete and absolute shift, Bradbury et al interpret the revisions embodied by nudge 'as part of a survival strategy for neoliberalism in policy, a jettisoning of a vital principle in order to allow the entire project to continue' (2013: 264). Here they do not suggest 'that neoliberalism as a concept has been abandoned, nor is it even in crisis' but, rather, nudge should be understood as 'a revision, a smoothing over of one of the flaws of neoliberalism with a supposed new discipline of behavioural economics' (Bradbury et al, 2013: 264). Here, as Wilkins (2013) concludes, the 'relationship between libertarian paternalism and neoliberalism is… a complimentary and mutually transformative one' (Wilkins, 2013: 4).

The rising prominence of nudge raises questions regarding what types of behaviour are deemed desirable and legitimate to intervene in and influence. In light of the growing standing of nudge interventions, Bradbury et al (2013) have called into question the ethics of nudge and have demanded close attention to questions such as who is influenced and targeted by 'choice architecture? (p. 262). As Bradbury et al (2013) make clear, this line of questioning is vital because nudges have 'real-life effects on people and their everyday lives' (p. 262 -263).

Although academic literature on the role of nudge in public policy is now being published (Goodwin, 2013; Mills, 2013; Pykett et al 2011; Jones et al 2013) and some scholars have even attempted to develop best practice guidelines for using nudges (Gill and Gill, 2012: 925), sustained critique of how nudges, as new forms of governmentality, are deployed in the water industry has not yet emerged. This is despite considerable interest in the ideas from the sector. For example, John Bourne, Defra's Deputy Director for Water Supply and Infrastructure, challenged the industry to consider how nudge inspired interventions could be used in order to influence water users' behaviours at the 2011 EA Tariff Trials Workshop. Moreover, a 2011 Ofwat report explicitly explored how nudge inspired policies could be

adopted in relation to metered households. The role of behavioural economics, particularly nudge, demands further investigation. Chapter six of the thesis examines how nudge tactics, as one of the multiple governmentalities at work in the South East of England, have been deployed through compulsory water metering in order to shape the way that the waterscape is governed.

2.10 Governmentality and The Big Society: Decentralisation, localism, economic liberalism and Victorian volunteerism

At the time of conducting research for this thesis, the Conservative government's vague, ideologically inflated – or as Kisby (2010) put it 'deeply flawed' - 'Big Society' political project had gained considerable currency in the popular press. The Conservative Party offered the Big Society as a way to rebrand itself prior to the 2010 general election, a way of governing through a smaller state and as a justification for deep public sector cuts following the 2008 financial crisis. In an attempt to differentiate the current party's values from those held in the 1980s, where Thatcher had infamously declared that 'there is no society', David Cameron argued that society is broken. He argued that greater individual responsibility, enterprise and entrepreneurship would be necessary to achieve a 'social recovery [and] to mend a broken society' (Cameron, 2011). In this context, the party claimed that the Big Society was its 'positive alternative to Labour's failed big government approach' (Conservative Party, 2010:1). According to Cameron, the Big Society would involve a combination of:

1. *Public service reform*. Facilitating an enhanced role for the private sector and social enterprises in delivering public services.

2. *Localism*. Encouraging 'community groups' to deliver local services. For example, the government's Free School movement invites groups of individuals, companies and social enterprises to bid for state funding and open new schools outside of local democratic control.

3. *Enacting 'a lasting culture change'.* For the Conservative Party, the Big Society would usher in a new brand of politics, with a different way of governing that favours

> a mix of deepening economic liberalism through privatisation, Victorian philanthropism and support for charities.

Recent academic literature has highlighted the deeply ideological and politically expedient nature of the Conservative Party's Big Society idea. North suggests that, in the context of economic crisis and persistent popular protests, the Big Society fulfils two functions. First, it affords 'cover' for government cuts to public expenditure and, in the longer term, it provides the ideological footing for deepening privatisation (North, 2011: 825). Similarly, Featherstone et al (2012) argue that the Big Society, as a way of governing, is 'not politically innocent' but 'part of a broader repertoire of practices through which the government has constructed the local as antagonistic to the state and invoked it to restructure the public sector' (p.177). Here the Big Society idea, according to Featherstone et al, is 'being employed to instigate a new round of "roll-back" neoliberalism' (2012: 177-178). Subsequently, the processes that make up the Big Society, namely greater economic liberalism, individual responsibility and a preference for private rather than public provision of public services, could have important implications for how the art of governing is reworked in the contemporary moment through compulsory metering.

Interest in the Big Society as force driving policy has now waned to the extent that the Prime Minister now rarely references the once flagship idea. Despite the relegation of the Big Society term from public consciousness, the key neoliberal ideological principles that underpinned its conception remain. Moreover, the Conservative party's promotion of the Big Society idea following its 2010 general election victory influenced the art of governing in the water sector. It is for this reason that the Big Society idea is taken up in this thesis and is considered as one of the multiple governmentalities that shape the art of governing the waterscape in South East England. More specifically, chapter seven examines how, at times invoking the language of the Big Society, private water companies have been encouraged to take on additional responsibilities for water welfare following the introduction of compulsory water metering.

2.11 Critiques of governmentality

Foucault's work on governmentality provides a fantastic range of tools for examining the emergence of multiple governmentalities and for analysing how water and water users are

governed through programmes like compulsory metering. However, the way governmentality approaches have been utilised exposes a number of limitations that should urge a sense of caution regarding the approach. The main criticisms governmentality studies have drawn refer to (1) an overemphasis of individual experience through focus on ways of self-governing; (2) a tendency to treat the art of governing as a straightforward process devoid of slippages and instability; and (3) an apolitical stance that lacks critical spirit. All three criticisms are serious and the accusations warrant close inspection. This section outlines the limitations of governmentality approaches and makes suggestions as to how these gaps might be addressed by bringing governmentality into conversation with other approaches.

2.12 The subject of governmentality: too individualistic?

Jessop accuses governmentality scholars of placing too much emphasis on the micro-physics of power at the expense of macro-analyses. This is not a fault Jessop finds with Foucault's work, for the latter's 'investigation of liberalism [in his 1977-78 lecture course] required movement beyond the microphysics of power to more-macro analyses' (Jessop, 2007: 63). In this sense, Foucault's work on governmentality should, at least in theory, be 'scalable' and could be applied 'just as fruitfully as to the conduct of conduct at the level of interpersonal interactions, organisations or individual institutions' (ibid). In cases where governmentality approaches focus almost exclusively on government of the self, the literature is open to accusations that it places a disproportionate focus on just one aspect of the art of government. Social practice theory provides an interesting contrast to governmentality in this respect as it raises questions regarding the utility of focusing on the individual. Proponents of social practice theory have tended to concentrate on climate change policy as well as energy and water demand management programmes such as metering.

Taking inspiration from social theories of practice that originate in Sociology (Giddens, 1984), proponents of social practice theory have highlighted that focusing on individuals' behaviours and experiences can obscure some of the principle reasons why resource intensive ways of using water emerge and become normalised. Consequently, rather than attempting to persuade individuals to use less water (or energy for that matter), social practice theory advocates urge researchers and policy makers to evaluate how resource intensive practices emerge and become stabilised (Hobson, 2006; Hargreaves, 2011b; Reckwitz, 2002; Shove, 2004; 2010; Shove and Panzar, 2005; Sofoulis, 2005; Hand et al, 2004; Strengers, 2009).

A "practice" in this context is understood as constituting three elements (1) images and meaning; (2) skills and practical know how; (3) objects, materials and tools (Shove, 2004). Examples include driving, cycling, showering, gardening and cooking. Here, Hand et al (2005) place considerable importance on thinking about practices as an assemblage of elements, they argue that:

The existence of a practice depends upon the specific inter-connectedness of many elements – forms of bodily activities, mental activities, things and their use of background knowledge in the form of understanding, know-how and notions of competence, states of emotion and motivational knowledge (Hand et al, 2005: para 5.6).

By exploring 'the relations between the various elements involved' rather than just the individual's behaviour, Hand et al (2005) argue that social practice theory possesses a unique set of tools for analysing how and why particular practices have arisen and, in some cases, locating how they may be interrupted in order to facilitate the emergence of more sustainable practices. For instance, Strengers (2012) explains that a social practice theory analysis of changing patterns of residential air conditioning use would differ substantially from conventional explanations that focus on almost exclusively on market economics, cultural symbolism (as high status) and changing individual lifestyles or choices. She notes that:

A practice theory perspective might view the increase in residential air-conditioning as the changing practice of household cooling, involving the complex co-evolution of material infrastructures (changing housing formats, central heating and cooling, the affordability and availability of the air-conditioner); common understandings of air-conditioning as a normal and necessary service, and changing notions of 'air', 'health' and 'wellbeing' associated with indoor climate and temperature; practical knowledge about how to cool the body and home; and rules about how to use and install the air conditioner (Strengers, 2012: 228-9).

In this example, social practice theory advocates are less interested in individual behaviours, and focus instead on the broader assemblage of images, symbols, objects, habits, knowledge and know how that contribute to transformations or evolutions in practices.

It is important to note that social practice theory perspectives are not homogenous, Shove et al (2012) for instance refer to 'weaker' and 'stronger' versions of the field. Here Shove suggests that Spaargaren et al's (2006) work, which 'treats domains of practice as *sites* in and around which consumers and systems of provision interact', is a weak form of social practice theory for it 'does not treat social practices as dynamic entities in their own right' (Shove et al, 2012: 1279). Whereas, according to Shove, Reckwitz (2002) represents a stronger form of social practice theory for, in this work, 'social practices take centre stage to the extent that people, and sometimes things, occupy secondary roles as the carriers of practice' (2012: 1279). This stronger brand of social practice theory, then, argues that 'social change is in essence a matter of understanding how practices evolve, how they capture and lose us, their carriers, and how systems and complexes of practice form and fragment' (ibid).

The most important insight that social practice theory offers is that it shifts the object of analysis from the individual to practices. In this context individuals are often portrayed as 'carriers' of practices. As Strengers (2012) suggests, 'this does not mean that individuals become redundant or unnecessary', individuals are understood as actively negotiating and performing a wide range of practices (p.228; also see Hitchings and Day, 2011). Consequently, advocates of social practice theory argue that in order to realise more sustainable outcomes focus should fall on how broader social practices emerge and how these can be transformed rather than necessarily considering encouraging individuals, through appeals to greater responsibility, to make more pro-environmental decisions. In this sense, social practice theory could potentially serve as a useful tool to complement governmentality approaches.

There are, however, problems with the social practice theory approach. Despite being a keen advocate of this approach, Hargreaves (2011a) has argued that social practice theory contains its own shortcomings in that it tends to focus on single practices and neglects the alliances and conflicts between them (for an exception see Pullinger et al, 2013). Moreover, he has argued that there is a need within social practice theory to better address the social and power relations involved in practices and how these practices are sustained, in part, by these relations (Hargreaves, 2011b: 96). Social practice theory can be normative, politically flat and lack critical insight.

Is there then, a different way to study practices that overcomes these short falls? Robbins' (2007) work on lawn care practices is illustrative in this respect. In essence, Robbins' goal is similar to that of social practice theory; he is interested in understanding how and why lawn care in suburban America came to be a prolific practice that, for some, causes ecological anxiety. Moreover, Robbins' work is congruent with social practice theory in that he argues that it is not enough to simply encourage people to alter their behaviour through behavioural change campaigns. Instead, taking a strong political ecology approach, he examines the complex ecological, economic, political and cultural dimensions to how people become enrolled and implicated in the practice of lawn management. Here he traces the assemblage further than social practice theories to include home owners and their neighbours, particular species of turf grasses, the lawn care industry as well as pesticides and fertiliser manufacturers. By taking account of the political, ecological and economic relations that contribute to constructing and enrolling individuals within the practice. Robbins' approach is able to offer critical insight into power structures where social practice approaches might struggle due to its normative character. So while taking inspiration from social practice theory might strengthen governmentality approaches by looking beyond the individual and their behaviour, it is also important to ensure that the analysis does not become detached from broader political and economic processes. In the context of this thesis, as chapter six shows, it is important to look beyond individual behaviours when examining the relationship between compulsory water metering and socio-technical change. However, it is important to ensure that the approach does not become normative but critically engages with the broader political and economic context in which compulsory metering occurs.

2.13 Governmentality: a 'too complete' process of government?

Despite some scholars, for example Miller and Rose (2008), stressing that governing is not a straightforward, complete process, a common criticism of governmentality literature is that programmes, policies and techniques of rule 'often appear as completed projects' (Rutherford, 2007; Hargreaves, 2012; Mackinnon, 2002). In contrast to Miller and Rose (2008), who emphasise that 'the programmer's world is one of constant experiment, invention, failure, critique and adjustment' (p.14), much other work on governmentality tends to present governing efforts as fully-realised projects that are without unanticipated outcomes or resistance in their application.

It is important to note that this accusation of homogeneity and failure to account for the messy and unpredictable aspects of governing should not necessarily be lodged at Foucault himself but the 'governmentality studies' literature that has since emerged. Throughout Foucault's work he called for a close and historically sensitive analysis of 'material operations', 'forms of subjugation' and 'apparatuses of knowledge' (2004: 35). In order to overcome the all too neat processes of government that tend to be reported through governmentality studies, Rutherford (2007) has called for an appreciation of the messiness of governing both in design and in implementation. Arguing that failing to grasp the messiness of governing hollows out the concept of governmentality and relegates it to an abstraction set apart from reality. In turn, she convincingly argues that:

This abstraction glosses over the ways in which strategies can, and often do, go astray when they meet their target of application. It ignores the interstitial slippages that can occur in the application of power and the moments of instability that emerge as a result... Governing does not arise a fully realised project, but is debated, revised, fine-tuned and continuously in need of re-articulation (Rutherford, 2007: 300).

Huxley has made similar observations, she notes that focus on governance rationalities 'can, at times, obscure struggles over discourses of truths and the messy, contingent and haphazard fashion in which localised practices of regulation get hooked up with, modified by, and in turn modify, rationalities for projects of government' (2008: 168). In this sense, the body of literature surrounding governmentality has tended to pay insufficient attention to politics of difference and exclusion, how particular subjects become authorised to speak on behalf of the environment and the possibilities of constructing alternative narratives.

In this context, some scholars, for example O'Malley et al (1997), have called for the 'messy actualities' of governing to be teased out. Similarly, Hobson (2013) has called for closer attention to be paid to the specific processes of *how* modes of government work rather than assuming that governmental interventions achieve 'hegemonic and totalising impacts' (p.180). Hobson calls for a 'realist governmentality' approach that is empirically driven and reflects the instability, failures, moments of resistance and slippages in governing (ibid). In a similar vein, Peck has also stressed that 'the *practice* of neoliberal statecraft is inescapably, and profoundly, marked by compromise, calculation and contradiction' (Peck, 2010: 106). In this context, Painter has argued for closer study of the 'mundane practices that give rise to "state

effects"' (or "stateness") (2006). Here he focuses on the 'more prosaic manifestations of state processes and how everyday life is permeated by "stateness" in various ways' and through various actors (2006: 753). While Painter highlights congruencies between prosaics and governmentality in that both 'focus on mundane practices and the productive nature of discourse', he also differentiates the two by arguing that 'governmentality draws attention to the construction of the objects of government, and to the logistics, rationalities and technologies of rule, whereas prosaics highlights the unsystematic, the indeterminate and the unintended' (2006: 763).

2.14 Governmentality: a loss of 'critical spirit'?

The second, related, criticism that has been lodged at governmentality studies is that, with some notable exceptions (see Watts, 2003 for example), it has 'lost the "critical spirit" present in Foucault's own work' (Rutherford, 2007: 302). For instance, O'Malley et al (1997), argues that much of the governmentality studies literature, has been complicit in 'evacuating the social relations' from the approach (p. 513). This is problematic, especially since Foucault himself emphasised that his project was not an apolitical one:

The real political task in a society such as ours is to criticise the working institutions which appear to be both neutral and independent; to criticise them in such a manner that the political violence that has always exercised itself obscurely through them will be unmasked so that one can fight them (Foucault in Rabinow, 1984: 5).

In this context, Rutherford (2007) has called for critical perspectives to be 'revalorized in governmentality literature' and for governmentality studies to take the processes of inclusion/exclusion seriously (p. 303). She has further asserted that contemporary uses of governmentality approaches 'need to be questioned, made messier, and informed by a critical perspective' (2007: 300). Hargreaves adds that these studies could be improved if they were to engage 'seriously with context, power and the full range of values that underpin everyday life' (2011a: 320). As lack of a critical perspective does not necessarily apply across all applications of governmentality (for example see Von Schnitzler, 2008). Nonetheless, these criticisms raise questions as to how governmentality approaches can be applied in a politically engaged fashion.

Although governmentality approaches provide useful tools for unpicking how compulsory metering programmes influence the ways that water and water users are governed, as this section has highlighted, this approach is not perfect. The key question then becomes, how to respond to these limitations? The remainder of this chapter argues that critical geography, particularly Harvey's framework of moments. The fit between these two approaches is not entirely neat, and the differences should not be elided, nonetheless the remainder of this chapter shows that, together, these two bodies of literature are useful for analysing the art of governing while retaining a critical spirit and accounting for the messiness of policy making.

2.15 The production of neoliberal natures

Although Gordon's (1991) reading of Foucault's position as the 'the conduct of living and the living' suggests that governmentality possesses scope to consider the relationship between society and nature, as highlighted further above, Foucault himself did not pursue these questions in any great detail. As Rutherford has astutely put it:

Foucault did not adequately deal with the way in which the political and ecological problematisation of populations also gave rise, in more recent times, to a similar problematisation of nature and environment (Rutherford in Lemke, 2011b: 170).

Other literature, particularly work in urban policy ecology, has investigated the production of waterscapes and nature much more directly and thoroughly. Here historical materialist approaches to the production of nature have been hugely influential in critiquing how and why particular ways of understanding and governing nature become dominant. One of the main strengths of recent work on socio-natures is that it excels in tracing the flows and relations of power within neoliberal governance systems, emphasising how society, nature and technology are internally related (Bakker, 2004, 2010; Gandy, 2003; 2004a; Harvey, 1996; Heynen et al, 2006; Kaika, 2005; Linton, 2010; Swynegdouw, 2004; 2007; Young and Keil, 2007). These approaches, to varying degrees, all utilise Marx's dialectical approach to understanding and questioning the world.

Smith's (1990) ground-breaking rebuttal of binary articulations of nature and society has inspired a wealth of work in geography; claims that society and nature are intrinsically interconnected and interrelated are no longer considered to be radical (Braun and Castree,

1998). Nevertheless, instrumental interpretations of nature and society often continue to pervade the imaginations of dominant policy making bodies. Here, influenced by 17th and 18th century liberal enlightenment principles, including, but not limited to, property rights, human emancipation and self-realisation, dominant approaches to water governance often present water as a resource, distinct from and externally related to society (Bellamy Foster, 2000; Harvey, 1996). A resource that can be dominated and exploited by humankind (Bakker and Bridge, 2006; Bellamy Foster, 2000). In this context, work on 'neoliberal natures' (see Himley, 2008 for an overview) has proved pivotal in studies analysing global water commercialisation and privatisation strategies (Bakker, 2004; Haughton, 2002). Here, as Harvey convincingly asserts, prevailing practices dictate a profit-driven transformation of environmental conditions and an approach to nature that treats it as a 'passive set of assets to be scientifically assessed, used and valued in commercial (money) terms' (1996:131, also see Robertson, 2010 & 2012). In this context, Heidegger's polemical proclamation that nature has become "one vast gasoline station" for human exploitation has some resonance (in Harvey, 1996: 131).

In contrast to liberal assertions that nature and society are discrete entities, scholars from both historical materialist and STS, particularly Actor Network Theory (ANT), backgrounds have challenged the 'false ideological dualism of society and nature' (Smith, 1990:32). Instead, those working underneath the banner of these bodies of literature stress the co-constitutive relationship between society and nature (Swyngedouw, 2004; Linton 2010). Proponents of STS, most prominently ANT, argue that greater attention should be paid to the agency of non-human actors (Barry 2006; Bijker 2007; Hinchliffe and Whatmore 1998; Latour, 1993; 2005; Whatmore 2002). For Latour, among others, this culminates in a call for the re-joining of nature and society, which he argues, have been separated under modernity (1993). Meanwhile, those operating from a radical geography perspective, many of whom take inspiration from Smith's pivotal work surrounding the production of nature, tend to share ANT's concern with obfuscating the perceived nature/society dualism. Most argue that socio-natures are coproduced and maintain that the objective is to 'renovate our conception of nature in a way that the dualistic world of bourgeois ideology can be reconstituted into an integrated whole' (Smith, 1990: 32). For example, Budds and Hinojosa (2012) explain that in their research on the relationship between mining and water they 'start from the idea that water is not merely a material substance that is subject to human manipulation, but a "hybrid nature" in which water's materiality and its social relations constitute and express each other'

(p. 119). They argue that this premise is productive because 'redefining water as co-produced enables us to think about not only the social processes that shape water, but also the ways in which water also shapes social relations' (ibid). Similarly, Linton employs the term 'hydrosocial cycle' to emphasise that 'instead of striving to master a presumed nature', this approach strives to 'challenge water's social nature' (Linton, 2010: 235). Such works do not treat water as an inert object but engage with its multifaceted materiality (Bakker, 2012).

Although rejecting binary categorisations of nature and society partially unites historical materialist and STS approaches, there continue to be considerable differences in the questions these bodies of work ask about the production of socio-natures. Historical materialist analyses differ fundamentally from that of ANT in that they focus explicitly on the questions that ANT deliberately elides: '*how* we produce nature and *who* controls this production of nature' (Smith, 1990:63). In this sense ANT and historical materialist approaches take different ontological starting points; the latter tends to be concerned with not only *how* things are produced by *why* things are produced in certain ways and for whose benefit (Kirsch and Mitchell, 2004: 702).

Smith's work highlights this disjuncture particularly well. He positions Marx's analysis of labour as the focal point in the relationship between nature and humans, arguing that the 'contemporary relation with nature derives its specific character from the social relation of capitalism' (Smith, 1990: 47). Thus, it becomes clear that 'nature and humans are simultaneously social, material and cultural' (Heynen et al, 2006:7) and that commodities (in terms of labour and "resources") are 'not *things* but, in fact, *socio-natural relations'* (Castree, 2003: 28, emphasis in the original). Through his analysis of the labour process and the production of socionatures, Smith is able to offer a radical critique of the epistemological separation of nature and society as well as illuminate the production and effects of uneven development. In this context, Kirsch and Mitchell (2004) convincingly argue that ANT possesses two main analytical weaknesses. The first weakness is that ANT provides no means for 'distinguishing among "things" – things of different powers, and things of different properties – save only as effect (p. 689). The second analytical weakness is one that Latour heralds as one of ANT's greatest strengths; the tendency within ANT to perceive power as a purely relational effect (ibid). However, positioning power as a relational effect precludes investigation into the causes of particular uneven power relations. Watts notes this criticism in his study of oil in Nigeria where he finds it more compelling to 'emphasise the ways in

which objects, networks and identities are built and how such construction matters' rather than to stop at mapping relationships (Watts, 1998: 245-246). Thus, while Castree's (2002) attempt to seek a rapprochement between ANT and historical materialism by incorporating 'weaker' forms of ANT within Marxist approaches to stress the agency of non-humans is useful (also see Rudy and Gareau, 2005), it does not appear to completely bridge the divergent interpretations of power.

Recent contributions from scholars adopting an urban political ecology (UPE) perspective have brought these tensions between ANT and historical materialist approaches under the analytical spotlight. For example, see Heynen (2013) for an excellent review of existing work on UPE and ways that the field has evolved, taking into account research in STS and feminist geographies. In general, it appears as though many UPE theorists have adopted the *language* of ANT but have retained an explicitly historical materialist ontology (e.g. see Swyngedouw, 2009). Therefore it can be concluded that while the terminology associated with ANT, of networks, nonhuman agency and hybridity, has to an extent proved useful in revitalising empirical studies of agency and human-nature-technology relations (Kirsch and Mitchell, 2004: 702), it is a truism that we cannot engage with the agency of human or non-human actors in a productive manner without also examining the nexus of power in which they are situated (Bakker and Bridge, 2006: 17).

In this context, Swyngedouw's (2004) work is particularly important. He combines some ANT linguistic tools with Marxian concepts of metabolism and circulation to provide a guiding framework that illuminates the production of socionatures. This approach has provided fecund ground for analysis of water governance as well as studying the production of commodities more broadly under neoliberal governance systems (Kaika 2006; Loftus 2006). 'Metabolic circulation', in this instance, can be understood 'as the socially mediated process of environmental, including technological and transfiguration, through which all manner of "agents" [human and non-human alike] are mobilised, attached, collectivised and networked' (Swyngedouw, 2006:32). Suggesting that socionatural environments cannot be understood as value neutral as 'these metabolisms produce socio-environmental conditions that are both enabling for powerful individuals, and disabling for marginalised groups (Heynen et al, 2006: 10). Linton describes this process of producing socionatural waterscapes as 'the business of fixing water', arguing that it 'is hardly just an intellectual performance; in each instance, it allows for certain hydrosocial realities while making it difficult or

impossible for others to spring to life' (2010:3). Consequently, 'the meanings of water that get fixed in any particular time and place can therefore be seen as a function of the relative power of different social actors' (Linton, 2010: 13). Of course, the way in which nature becomes 'fixed', expressed or understood does not occur in the same way across different spaces and places (Castree, 2008a).

In addition to market environmentalism (see above), Castree (2008a) identifies three other types of fixes that contribute to the neoliberalisation of environments. The first of these fixes has synergies with Harvey's concept of 'accumulation by dispossession' and involves 'extending capital's formal and/or real subsumption of nature *without any overtly 'ecofriendly' motivations* so that 'the nonhuman world simply becomes a means to the end of capital accumulation (p. 147, also see Roberts, 2008). Meanwhile the second relates to the active degradation of the environment in the pursuit of profit (Castree, 2008a: 148). Whereas the final fix Castree describes refers to way the state seeks to manage nature. He suggests that 'the state might make formal efforts to encourage citizens to take personal or communal responsibility for the 'goods' and 'bads' that arise from nature's neoliberalisation' (ibid). According to Castree, 'such efforts can help ensure that the state avoids or minimises future legitimation crises in the environmental arena' (2008a:149). This last fix is similar to Foucault's work on governmentality in that it examines how both forms of knowledge and ways of governing the individual contribute to reproducing the waterscape

While there are some consistent factors involved in the process of neoliberalisation - in the context of water governance, it tends to involve the conceptualisation of water as a commodity, commercialisation, financialisation, the re-articulation of citizens as consumers and the introduction of market principles into water delivery systems (McDonald and Ruiters, 2005) - it is also important to note that neoliberalisation is a 'spatiotemporally variable *process* ('neoliberalisation') rather than a fixed and homogenous thing ('neoliberalism') (Castree, 2008). In the context of water, this echoes Haughton's assertion that while 'the production of water as a commodity is largely a transnational process' it is equally important to acknowledge that 'the actual manifestations of this are certainly nationally and locally contingent' (Haughton, 2002).

In some senses, Foucault's concept of governmentality appears to strike a chord with studies which examine the production, and more specifically, the neoliberalisation, of socionatures.

Here, the neoliberalisation of nature can be understood as a specific 'regime of truth' (Rose, 1991) that has subsequently shaped modes of environmental governance (Roberts, 2008). As Raco highlights, 'a Foucauldian approach draws attention to how subjects are created in different places and at different times and therefore provides an insight into the ways in which (neo)liberal states use space and place to pursue their strategies of action' (2003:78). UPE's close attention to the processes whereby socio-natures and waterscapes are produced and sustained complements concerns articulated by governmentality approaches regarding the art of governing yet strengthens its insights by offering a more explicit critical analysis. Together these approaches, as this thesis shows, provide an excellent framework to analyse compulsory water metering programmes. In particular, chapters six and seven demonstrate that Foucauldian and historical materialist approaches can be usefully combined to evaluate compulsory metering programmes in South East England. Chapter six draws on Foucauldian and historical materialist tools to demonstrate that metering is best understood as a socio-technical fix that has the effect of partially solving some of the tensions in the water industry while strengthening the neoliberal character of the sector. Meanwhile, chapter seven, which focuses on the relationship between metering and affordability, examines how, as a biopolitical problem, affordability is managed through compulsory metering. These chapters contribute to developing a theoretical framework that retains a critical approach and takes account of the messiness of sociotechnical change in the waterscape.

2.16 The production of technonatures

White and Wilbert use the term 'technonature' to describe a world that is 'ever more technologically mediated, produced, enacted and contested' where and, 'diverse peoples find themselves, or perceive themselves, as ever more *entangled* with things – that is, with technological, cultural, urban, and ecological networks and diverse hybrid materialities and non-human agencies' (2009: 6). The role of technologies in reproducing waterscapes has recently received considerable attention in geography and related fields. For example Bakker (2012) has argued that socio-technical objects mediate the dialectical relationship between society and nature and that, accordingly, water should be understood as 'simultaneously socio-technical and socionatural' (2010: 616-8). Recent work has explored the role of canals (Carse, 2012), dams (Coutard and Guy, 1999), water pumps (de Laet and Mol, 2000; Barnes, 2012), water meters (Jaglin, 2008; Loftus, 2006; Marvin et al, 2011; Trentmann and Taylor, 2005; Von Schnitzel, 2008) and household water infrastructure such as showers, taps and

toilets (Hobson, 2006; Kaika, 2004; Soufoulis, 2005; Shove, 2004; Strengers, 2009) in negotiating the socionatural make up of different places.

Some geographers, for example Furlong (2010), have argued that combining insights from STS and geography might lead to more nuanced conceptualisations of the role of water technologies in socio-technical change. Furlong (2010) states that studies of technology in geography tend to treat the 'impact, function and use of technologies as given' (p.2), Whereas, Coutard and Guy have alleged that geographical studies of pre-paid metering have been overly pessimistic and generated a sense of unjustified 'alarmism' with respect to infrastructural change. While these insights are important, this thesis does not provide a full STS analysis of water meters. Rather than exploring the complex materialities of the water meter and its configuration, for which an STS approach would be instrumental, this thesis uses metering programmes as a lens through which to explore and better understand how water and water users are governed. This does not mean that metering technologies are understood in this thesis as stable, black-boxed entities, nor does this thesis adopt a pessimistic approach to technology or adapt a sense of 'alarmism' about technological change; rather water meters are positioned, following Feenberg (1997), as contingent technologies that have the potential to influence the waterscape in multiple ways.

Technologies, such as water meters, do not necessary produce predicable changes to the socio-natural landscape. Here, as Marvin et al (2011) argue, water meters can act as 'mediating technologies' whose effects may be uncertain or unintended (also see Furlong, 2010). Similarly, Coutard and Guy stress the 'deeply contingent nature of the appropriation of new technologies, and as a consequence, [the equally contingent nature] of the social "effects" of technologies' (2007: 713). Importantly, technologies, according to Feenberg, have 'no singular essence' but are socially contingent and could therefore be reconstructed to play different roles in different social systems' (1999:7). For instance, Marvin et al (2011) trace the different ways that smart meters can be used to structure relationships between utilities, users and the technology depending on the configuration of the technology and the socio-economic conditions within which decisions are made. Whereas Pritchard (2011, 2012) and Von Schnitzler have explored how water technologies often reflect the contemporary political and social processes in which they are introduced; the way that technologies are applied is not politically neutral. In this context, Barry (2001) argues that a 'distinction can be made between a *technical device* conceived of as a material or immaterial artefact, and a

technology, a concept which refers not just to a device in isolation but also to the forms of knowledge, skill, diagrams, charts, calculations and energy which make its use possible' (2001: 9, also see Whatmore, 2009 on knowledge and the distribution of expertise). For Feenberg, the ambivalence of technology is important because it translates to the 'availability of technology for alternative developments with different social consequences' (ibid). The 'effects' of technologies in this instance may be unanticipated. Feenberg's reflections raise important questions regarding whether compulsory water metering might contribute to producing a potentially more progressive waterscape, or replicate inequalities that already exist within the socionatural waterscape. This question is central to the thesis and each of the four analysis chapters in examining the role the water meter plays in helping to renegotiate the way water and water users are governed in South East England.

As is explored throughout this thesis, water metering has been, and continues to be, an important conduit through which questions of governance evolve. Key to this are debates centred on what is considered 'fair' in relation to how water and water users are governed. What counts as fair, and how this is measured, has been fiercely debated, not just in relation to water but geography and related disciplines more generally. Rawl's (1971) work on justice and social contract theory, Sen (1999) and Nussbaum's (2003) work on capabilities and social justice and Harvey's work on transformative notions of social and environmental justice have been particularly important in prompting questions regarding 'fairness'. For example, who is it that decides what is 'fair'; whether there are certain characteristics that are fundamental to 'fairness'; how the needs of the individual can or should be squared with the needs of the collective and under what conditions 'fairness' can be achieved'.

Although what is understood as a fair situation changes according to the context, discussions regarding fairness are often grounded in questions of how and to whom resources are allocated; this involves procedural issues as well as questions of production and power. As such, debates surrounding 'fairness' are often intertwined with notions of justice (for example, see Walker and Burningkam 2011). In the context of water metering and water governance, geographers have also emphasised that notions of fairness should reflect the needs of multiple users, including both human and non-human natures (Chappells and Medd, 2008: 725).

Recent work on fuel poverty and exposure to flood risk has highlighted some of the key issues surrounding fairness in the UK context. Walker and Day (2012) describe fuel poverty as 'fundamentally a complex problem of distributive justice', where resources are allocated in a way that results in gross inequality, but also emphasise that addressing fuel poverty must involve 'recognition of vulnerable and marginalised social groups' and the pursuit of 'procedural justice through opening up involvement and influence in decision making processes' (p. 275). Similarly Walker and Burningkam (2011) have stressed the importance of analysing what is expected to be a just and fair situation and exploring how institutions manage perceived injustices. Common across these studies is a concern with (1) the notion of 'fair distribution'; the definition of which is deeply contested depending on whether the issues is approached from a utilitarian, libertarian or egalitarian position; (2) procedural justice where the application of rules is considered fair and (3) the ability of people to decide for themselves what conditions constitute fairness, influence decision making processes and make meaningful decisions over their everyday lives. These articulations of fairness are important for theorising and better understanding the dynamics of fairness and justice.

Nevertheless, this thesis does not seek to impose a definition of fairness, instead it examines the important role water metering programmes have played in negotiating and framing the emergence of different understandings of fairness in relation to water and water users in the South East of England. As chapters four, five and seven show, the understandings of fairness that emerge in relation to different metering interventions offer conflicting perspectives with respect to what constitutes fair water use as well as fair ways of governing water and water users.

2.17 'Moments' of socio-technical change

This thesis utilises Foucauldian tools of genealogy and governmentality to examine how and why compulsory metering became, from the perspective of some water companies and policy makers, a legitimate way of governing water and water users. Foucauldian tools are also employed to explore how the introduction of water metering, in its various guises, has influenced, and continues to influence, the way that water users engage with water through processes of self-governing and the way that the state, loosely defined, practices processes of government. As highlighted earlier in this chapter, while important, governmentality is an imperfect framework through which to analyse and interpret these questions. This thesis

brings work on the production of nature, specifically Harvey's framework of 'moments', into conversation with governmentality approaches. In doing so, it recognises that while there are productive tensions between these positions there are also limits to any attempt at rapprochement (see below). This thesis is not suggesting that the two approaches can be utilised together in a seamless fashion rather, recognising that they can be employed to different ends. Foucauldian tools offer the method of analysis, while Harvey offers the thesis an interpretative framework.

Harvey's work on 'moments', initially set out in his 1982 volume *Limits to Capital*, builds on Marx's dialectical method. Here he carefully considers the evolution of capitalism as well as the consistent failure of alternatives to mount a successful challenge to dominant ways of social organisation. In *Limits to Capital* Harvey explores and evaluates Marx's approach. He argues that:

Marx sees each relation as a separate 'window' from which we can look upon the inner structure of capitalism. The view from any one window is flat and lacks perspective. When we move to another window we can see things that were formerly hidden from view. Armed with that knowledge, we can reinterpret and reconstitute our understanding of what we saw through the first window, giving it greater depth and perspective. By moving from window to window and carefully recording what we can see, we come closer and closer to understanding capitalist society and all of its inherent contradictions (Harvey, 1982: 2).

Harvey explores his work on moments in greater depth in his 1996 volume, *Justice, Nature and the Geography of Difference*. Here he identifies 'six distinctive "moments" to the social process' which, he argues, 'are basic markers to chart much of what goes on in social and literary theory' (1996: 78). The six moments include discourses/language; beliefs/values/desires; institutions/rituals; material practices; social relations and power. Harvey presents the moments in 'no particular order of significance' and uses the 'term "moment" in order to avoid, as far as possible, any sense of prior crystallisation of processual activities into "permanences" – things, entities clearly bounded domains, or systems' (1996: 78). He uses these six loose moments in a dialectical fashion to help explain how social change occurs.

In later works, Harvey has developed this approach further and, in doing so, draws on a fascinating footnote in Chapter 15, vol. 1 of Capital *On Machinery and Large Scale Industry* that sets out how six different moments - technology, nature, relations of production, everyday life, technology, social relations and ideas – 'co-evolve in ways that accommodate and consolidate the permanently revolutionary character of capital' (Harvey, 2010: 127). To these six moments, Harvey adds a seventh, institutional arrangements, and argues that capital 'cannot circulate or accumulate without touching upon each and all of these activity spheres in some way', noting that where barriers are encountered either within or between these moments, then 'ways have to be found to circumvent or transcend that difficulty (2010: 124). He argues that social change occurs through the uneven co-evolution of these internally related moments and calls for a non-determinist framework for conceptualising social change. As Hartstock noted, 'Harvey suggests that moments are linked to but not bounded by time or space in any simple way; they are instead conceptual tools that can help to address complex and over determined social relations' (Hartstock, 1998: 708). Each moment is dialectically related, internally dynamic and, importantly, no moment is assumed to be determinate (Harvey, 2010: 128). This does not mean that the seven spheres should always be given equal weight but rather 'that the dialectical tension within their uneven development should always be borne in mind' (Harvey, 2009: 134). Methodologically, this framework is useful because, as Harstock highlighted:

The concept of "moment" can then be analytically useful in both separating out the social relations the theorist wants to concentrate on while reminding us that these social relations are in fact connected with and defined by other social relations and with their own pasts and future possibilities (Hartstock, 1998: 709).

Harvey makes clear that slippages or possibilities can emerge in any of the connected moments but demands that those striving to better understand the dynamics of capital, or foster the emergence of alternative futures, should consider how these seven moments co-evolve, unevenly, to create a totality rather than focusing on one element in isolation. He argues that 'perhaps one of the biggest failures of past attempts to build socialism has been the reluctance to engage politically across all of these spheres and to let the dialectic between them open up possibilities, rather than close them down' (2009: 134). There are no steadfast rules regarding which moment one should initially engage with. Here Hartstock helpfully describes the moments as 'filters' that can be 'changed as one moves analytically among

different moments, and then different aspects of the social relations will be revealed'. Loftus also engages with Harvey's work on moments in his 2012 volume *Everyday Environmentalism*, here he takes nature and everyday life as his moments of departure noting that these moments are unrepresented in existing studies, this does not mean that he obscures the other moments identified by Harvey or considers nature and everyday life as determinant (p. xix). Similarly, using Harvey's framework, there is nothing to prevent scholars taking other moments which they feel have been neglected as a starting point.

A number of critics have expressed concerns with Harvey's method of moments. For instance, Hartstock has called on Harvey to be much more precise in his views on marginality and where he locates historical agency (1998). Similarly, Iris Marion Young has argued that Harvey's understanding of social difference equates to a politically disabling and fragmented political approach which is 'both theoretically and politically counterproductive' (1998: 37). She concludes that although 'Harvey usefully reminds us that the situated differences of gender, race, ethnicity and sexuality ought not to be frozen into essential identities' and 'recognises the complexities of cross-cutting structured and shifting relationships in some places in his text, he nevertheless returns to an oversimplified account of class politics when he discusses appeals to justice and norms of solidarity' (1998: 39). Furthermore, Braun has underlined how Harvey's model has the potential to collapse difference, so that certain relations, especially those of race and gender, are overshadowed by class analysis. Here Braun argues that greater attention ought to be paid to the scale at which analysis occurs (Braun, 1998: 714).

More recently, Thompson (2010) has argued that some moments should not be treated in the same way as others. He argues that 'daily life' 'should, in fact, be granted analytic and strategic primacy' for, according to Thompson, '"daily life" both predates and permeates all the other moments' (2010: 273-274). Here, Thompson implies that Harvey is guilty of pandering to 'abstract empiricism of bourgeois economics' and 'abstract idealism of professed revolutionary norms' (2010: 283). It is true that Harvey's framework is not perfect. More could be done, perhaps following Foucauldian governmentality, to tease out the dynamics and differences in peoples' situated experiences and agency. However, this is not cause for abandoning the framework of moments nor does it justify accusations of economic determinism. Harvey explicitly rejects this type of reductionist tactic, he states that 'problems arise when one or the other of these perspectives is exclusively and dogmatically viewed as

the only source and hence the primary political pressure point of change' (2009: 13). He argues that many approaches unwittingly espouse 'dangerously oversimplisitic monocausal explanations' (2009: 134). He explicitly cites technological determinism, environmental determinism and class determinism as examples of movements which have failed because they do not hold these distinct, yet internally related, moments together. This clear dismissal of determinism, and emphasis on movement across moments, should unsettle any lingering suspicions, or accusations, that Harvey's work harbours economic determinist leanings. For Harvey, it is important to focus, first, on whichever moment is most immediate or offers up potential political leverage or exposes ruptures and possibilities (2010: 34).

This thesis draws Harvey's work on moments, particularly in Chapter six, to examine and interpret the messy dynamics of the socionatural and sociotechnical changes that have taken place through compulsory water metering programmes in the South East of England. Chapter six identifies a series of moments, which are loosely based on Harvey's, to analyse how socio-technical change occurs across multiple, interrelated moments. It explores how the introduction of the compulsory water meter, has, together with new ideas surrounding behaviour economics; social relations; the way that the water company is understood; how relations to water is understood and water users' everyday interactions with water, combine to transform the waterscape and, ultimately, how water and water users are governed. Moving between these moments enables close attention to the messy nature of sociotechnical change and an appreciation of how changes in one moment can inspire changes in other moments, sometimes in unanticipated ways. Chapter six demonstrates that water companies in the South East have been able to use compulsory metering to (partially) resolve a perceived tension between water use and water stress by making changes across these dynamic moments. In this sense, Harvey's framework of moment provides vital inspiration for explaining and analysing the ways that water and water users are governed through water metering.

2.18 Governmentality and the production of nature: productive tensions and their limits

Invoking Foucauldian approaches alongside historical materialist ideas is not without difficulties, particularly considering the different conceptions of power that they offer. This

short section demonstrates that tensions between the two approaches are significant and warrant attention. Yet the same tensions are productive for exploring how water metering has emerged as a desirable policy option for some water companies as well as how water and water users are governed in and through compulsory water metering. The two approaches can be used to tackle different questions and, in this thesis, are utilised for particular analytical effects.

Barnett (2005) argues that it is undesirable to seek a rapprochement between marxist and Foucauldian approaches, arguing that

… Marxist and Foucauldian approaches are not necessarily as easily reconciled as it might seem. They imply different models of the nature of explanatory concepts; different models of causality and determination; different models of social relations and agency; and different normative understandings of political power (p.7).

Harvey's own interpretations of Foucault's work also reveals significant tensions. Harvey has criticised Foucault's work as being insufficiently dialectical (2007: 46), suggesting that while governmentality 'has something important' to say for it 'interestingly analyses the intersections between two spheres – institutional and administrative systems and daily life (construed as body politics)', its analysis is 'unidimensional' because it does not address how these two moments co-evolve with aspects of social change (Harvey, 2010: 134). Moreover, Ekers and Loftus (2008), for instance have highlighted that Foucault was suspicious of some variants of Marxism and its interpretation of ideology. For Foucault, some Marxist approaches that linked ideology to some sort of deeper, hidden truth risked missing 'how truth always operated with discourses and practices, generating specific effects' (Ekers and Loftus, 2008: 705). For Foucault there is no determining form of power, rather it is 'situated and exercised at the level of [everyday] life' where there are continual struggles over the understandings of what the "truth" may be and in what form certain governance practices emanate (Rabinow and Rose, 2006:296). Within this process, particular assemblages of certain power relations come to dominate others at certain times.

Barnett's insights, as well as Harvey's own criticism of Foucault and Foucault's suspicion of Marxist approaches, expose some fundamental differences between the two approaches with

respect their ontological and analytical starting points. Nevertheless some of the tensions are productive for better understanding processes of sociotechnical change in the water sector.

Foucault and Marxist approaches are not, however, completely incompatible. For instance, as Ekers and Loftus (2008) highlight, there is potential for a rapprochement between the way Gramsci conceptualises power and Foucault's focus on *practices* of power (see Foucault, 2008: 321). Similarly, Hunt (2004) argues that it would be a gross error to exaggerate the differences between historical materialist and Foucault's own understandings of power. He argues that, even if Foucault did not directly quote Marx, 'much of Foucault's intellectual formation was decisively influenced by the looming presence of Marxism in the post-war France in which he lived' (2004: 604). Hunt reasons that 'although Foucault's views were often articulated in terms different from Marx, they are by no means incompatible' (2004: 604). He concludes that 'Foucault's views are much closer to Marx than he was even prepared to concede' (ibid). Specifically, Hunt has stated that

The distance between Foucault and Marx might not be so great as Foucault suggests, [because] both are concerned to account for change and to promote it. Foucault attends to how to 'think differently' and to 'conditions of change' but, similarly, Marx focused on the 'conditions of existence' that identify the necessary and sufficient conditions for the emergence of some social form (2004: 604).

Here Hunt suggests that Foucault takes issue with 'Marxism-Leninism' rather than Marx's own work. Similarly, Jessop has highlighted that Foucault's work includes 'an implicit appropriation and development of insights from Marx himself' and makes the case that Foucault was not rejecting Marxisms in their entirety but was in 'opposition to official and vulgar Marxist positions' that were prevalent at that time (Jessop, 2007: 34). Likewise, Hunt argues it is likely that Foucault's 'estrangement was not so much with Marx, but with the French Communist Party' (PCF) (2004: 604). This positions is supported by Jessop's (2011) work which highlights that Foucault's research on governmentality explored similar questions to those posed by Marxist scholars. In this sense, Foucault's work on governmentality has clear synergies with historical materialist approaches. To illustrate this, it is worth quoting from Jessop at length. Jessop argues that:

Foucault himself explored not only the generalisation of the conduct of conduct across diverse spheres of society but also studied how specific governmental practices and regimes were articulated into broader economic and political projects. Thus he continued to argue into the late 1970s that capitalism had penetrated deeply into our existence, especially as it required diverse technologies of power to enable capital to exploit people's bodies and their time, transforming them into labour power and labour time respectively to create surplus profit (Jessop, 2011: 60).

With this in mind, in certain situation, the gulf between Foucauldian and historical materialist approaches might not be as great as some commentators have argued. Nonetheless, the fact remains that there are limits to any attempted rapprochement between the two positions. With this in mind, this thesis uses Foucauldian methods to examine the emergence of compulsory water metering through historical experiments with metering, changes in the modern state – specifically how the state has responded to particular biopolitical problems associated with water metering - and the processes of governing that are expressed through metering. Meanwhile, Harvey's work on moments is employed as an interpretative framework to explore the dynamic processes of sociotechnical change that have taken place in the neoliberal water sector through contemporary compulsory water metering programmes in South East England. Here these two approaches are deployed to tackle different elements of the debates surrounding water metering.

2.19 Conclusion

This chapter has shown that, although not entirely compatible, Foucauldian and historical materialist approaches are fundamental to developing a framework for better understanding how compulsory water metering programmes have emerged in the South East of England and how water and water users are governed through metering. The concluding section of this chapter outlines how the literature reviewed is engaged with throughout the thesis.

In chapters four and five, the thesis draws on Foucauldian methods of analysis to develop a genealogy of metering in England and Wales which examines how water and water users have been governed in different ways through metering interventions. In doing so, these chapters make two main contributions. First they build on and take forward existing literature in geography on biopolitics by identifying the myriad of biopolitical problems that metering

has been invoked to address. Secondly, these chapters examine how these technologies, in their various guises, have been used to negotiate different understandings of the waterscape, particularly in respect to notions of fairness. These chapters stress that the process of negotiation is not a neutral process yet and the meter, as a contingent technology, has the potential to help produce waterscapes that can be perceived to be negative as well as positive. This corresponds with research objective one and explains how and why compulsory companywide metering, from the perspective of some within the sector, has emerged as a legitimate and desirable policy in the contemporary moment. This history of the present, helps tell the story of water companywide compulsory metering in South East England.

Chapter six then examines how water and water users are governed through compulsory companywide metering programmes in the contemporary moment. The chapter identifies moments (which are loosely structured around Harvey's moments) and moves between them, one by one, to explore the messy processes whereby different moments together, in tension, co-evolve to produce and reproduce the socionatural waterscape. This is important for understanding the metering programmes in South East England as socio-technical fixes where the water companies have sought to address some tensions in the waterscape yet have ensured that its neoliberal character is retained. This sociotechnical fix takes place across each or the interlinking and interrelated moments.. Importantly, the chapter also takes forward existing literature on governmentality by exploring how behavioural economics, in particular work on nudge, has been deployed through metering programmes in an attempt to influence the way that water and water users are governed. The chapter explores how metering interventions are taken up and resisted by water users.

The final analysis chapter addresses a gap in the existing literature; it examines the relationship between compulsory metering and affordability. The chapter explores how the introduction of compulsory water metering influences water affordability patterns. Affordability in relation to compulsory metering is portrayed as a biopolitical problem which water companies are seeking to manage through new schemes. The chapter, in response to research objective three, reveals that the introduction of compulsory water metering has led to the stretching of water company roles as they develop and implement programmes to tackle affordability problems caused by metering. The chapter argues that this change to the waterscape, negotiated through compulsory metering, has important implications for thinking about the character of the waterscape, especially in terms of the govermentalisation of the

state, non-linear contingencies of the state and understandings of democracy. The following chapter outlines the methodological approach that the thesis has followed.

3 Methodology

At its simplest, methodology is the way in which information is collected. It concerns both the ways in which data are gathered and the techniques used to analyse or interpret them (Ruming, 2009:451).

3.1 Introduction

Water companies tend to commission research projects hoping to *prove* that water metering does or does not *work* or that a particular communications strategy *works* best in order to justify investment decisions. Here the research process is often treated as an objective, scientific collection of 'facts', a process that can seem rather remote from the messy, fleshy world that we inhabit. Of course it is important to understand whether metering works or, at least, whether it delivers the anticipated effects (see Parker and Wilby, 2013 for a discussion of how qualitative and quantitative methods can be used in combination to better understand household water demand). However, at the time of writing, sufficient quantitative data is not yet available to analyse the relationship between metering and household demand in a meaningful fashion. Rather than asking whether metering "works" (e.g. delivers a c.10 per cent demand reduction) my research, overall, is concerned with better understanding the genealogy of water metering, exploring how water metering might influence the ways people relate to water and how the waterscape is reproduced as a result of compulsory companywide metering programmes. Accordingly, I am primarily interested in (i) how and under what conditions, at least from the perspective of water companies in the South East of England, the regulator and the government, these programmes have become legitimate and desirable policy interventions and (ii) how the introduction of a might influence peoples' practices in relation to water and contribute to the reproduction of the socionatural waterscape. This line of inquiry requires a methodological approach that equips the researcher with means to elucidate the complexities of 'environment, individual experiences and social processes', for this, as Winchester and Rofe suggest, qualitative methods are most appropriate (2010:2).

Recently, academic researchers have used qualitative methods to tackle some of the questions that positivist approaches have obscured. For example see Medd and Chappells' (2007) work on flooding, Shove's (2004) work on comfort and cleanliness, Strang's (2004) research on how the meaning of water, Knamiller and Sharp (2009) on trust and fairness in the context of Folkestone and Dover's compulsory water metering programme in Kent and Pulligner et al (2013) on water use practices. Unfortunately, qualitative methods are commonly referred to as *fluff* or, more sympathetically, as *colourful* in the water sector; qualitative methods continue to be interpreted as subordinate to quantitative techniques.

Nevertheless, qualitative approaches have become increasingly mainstreamed in the water sector as companies seek to fulfil the regulator's requirement that companies should demonstrate the extent which their plans are supported by their customers. Much of the qualitative research undertaken in the UK water industry has taken shape through large scale surveys. While these approaches are vital, large scale surveys typically aim for 'breadth and coverage' rather than 'depth and detailed understanding' (McDowell, 2010: 158). Most water companies undertake little research explicitly from domestic water users' perspectives; often customer research is tagged onto the back of an existing project or narrowly framed for a particular end (although there are notable exceptions, see CCW 2007 and Doron 2011's deliberative research with household water users).

This chapter outlines the methodological approach and tools utilised throughout the thesis. It begins by providing the rationale for the case studies chosen for this research. It then outlines the research methods used and makes links between those methods and the literatures reviewed in the previous chapter. Subsequently, the limitations of the research are reflected upon and, finally, the chapter outlines how the data has been analysed and translated into a thesis.

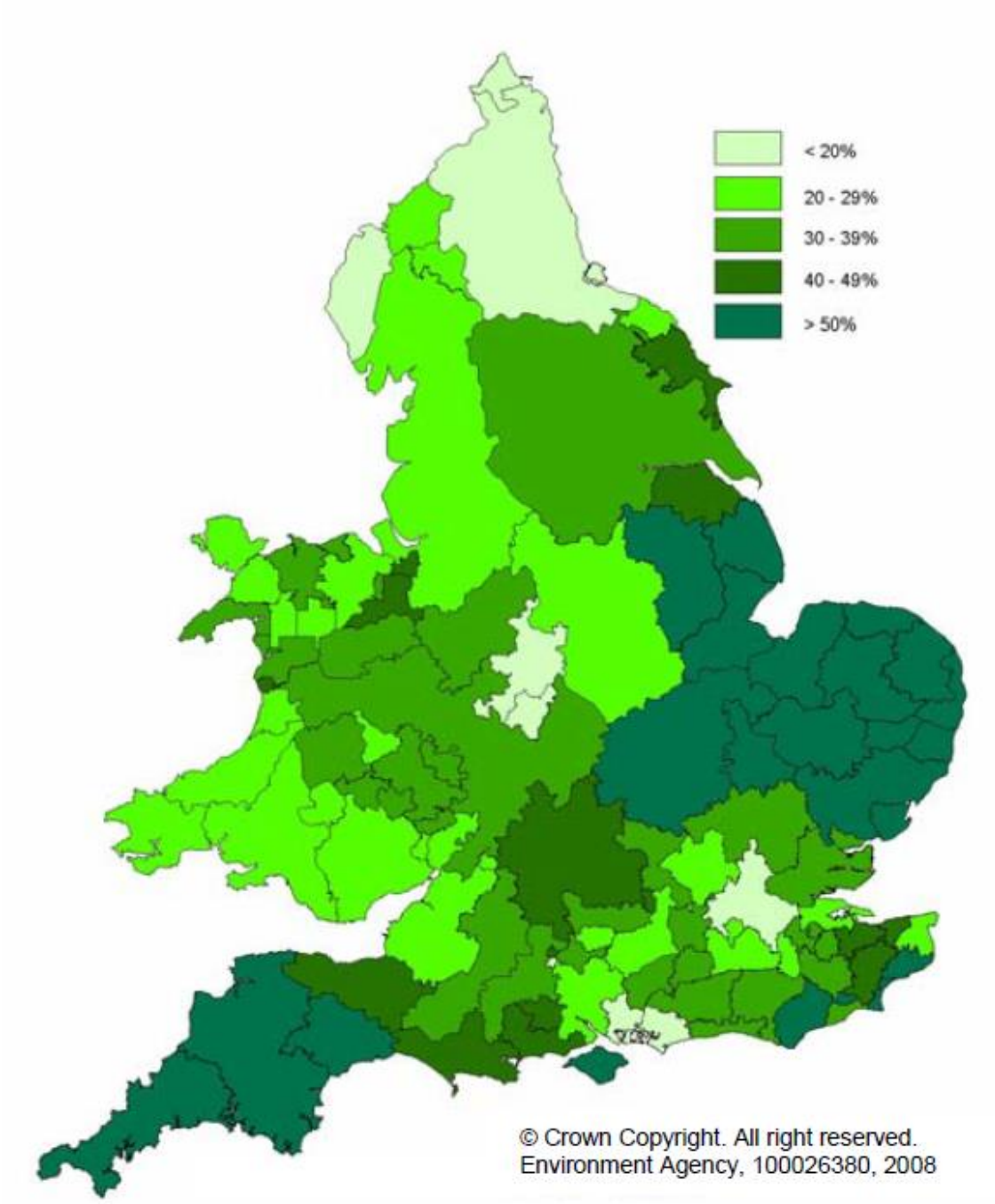
3.2 Choosing "Case Studies"

There are 21 private water utilities in England which operate as regional monopolies. Ten of these companies are water and sewerage providers and the remainder are water only companies. Each of these companies has its own specific history and contextual circumstances that make it an interesting potential focus of inquiry. For example, the percentage of households that are metered varies considerably across England (see Figure 3).

Some companies in water stressed areas have commenced large scale compulsory metering programmes others, for example Northumbrian Water, United Utilities and Yorkshire Water, have stated that such programmes will not feature in their water resource management plans in the immediate future. These companies argue that due to more abundant water supplies that are available in the north of England, it is not necessary to effect demand reductions through household water metering. Northumbrian Water have stated that if they were to pursue a metering programme, it would have to justified in terms of establishing a fairer charging system, fair in this context meaning that customers would only pay for what they use[10], rather than on the basis of demand reduction (Northumbrian Water, 2009). Although it would be extremely valuable to explore attitudes and responses to water and water metering in areas of England outside the water stressed South East, this is outside the scope of this doctoral research.

[10] The ways in which fairness is articulated in relation to metering is explored in greater detail in chapters four and five

Figure 3 Proportion of households metered (Source, EA: 2008)



This thesis focuses on Southern Water (SRN), South East Water (SEW) and Thames Water (TW) because these companies committed to undertaking a companywide compulsory metering programme in their respective 2009 Water Resource Management Plans (WRMP). Although the scale and pace of implementation vary, these three companies have committed to (near) universal compulsory metering (see Table 3). Companywide compulsory metering programmes are unprecedented in the English waterscape, therefore it is important to trace how and why these programmes came to the fore and better understand how water meters might influence the way people relate to water.

Table 3 Outline of selected water companies in South East England

Water Company	Supply area	Meter penetration in 2011	Metering programme
Southern Water (water and sewerage) *Serious water stress classification*	Supplies water to one million customers and wastewater to two million customers across Sussex, Kent, Hampshire and the Isle of Wight.	c. 40%	Universal Metering Programme: 92% households to be metered on a compulsory basis by 2015
South East Water (water only) *Serious water stress classification*	Supplies water to 2.1 million customers across Kent, Sussex, Hampshire and Berkshire.	c. 40%	Customer Metering Programme: 70% households to be metered on a compulsory basis by 2015; 90% of customer base by 2010.
Thames Water (water and sewerage) *Serious water stress classification*	UK's largest water and sewerage company, serves 14 million customers across London and the Thames Valley.	c. 30%	Initial 10 year strategy of compulsory metering from 2010. 50% penetration by 2015; 80% by 2020. Delayed. Progressive Metering programme due to start in 2015.

Before detailing the research methods that have been used, it is important to make it absolutely clear that this is not comparative research in the traditional sense and nor am I seeking to generalise from a particular case (Baxter and Eyles, 1997). Following Ward, I am keen to avoid the 'rather fixed and static theorisations of place, space and scale that tend to

continue to characterise much of the comparative urban studies literature' (2010: 473). In seeking to circumvent these issues, I have adopted the relational comparison approach advocated by Hart (2002) and Ward (2010). Relational comparison approaches differ from traditional comparative approaches that tend to focus on how and why discrete sites might be similar or different and what this means for the establishing or destabilising universal rules (Ward, 2010: 475). Instead, a relational comparison approach considers how places are historically formed and produced in relation to other spaces. This means stressing interconnectivity and considering what careful examination of a particular place can reveal about broader processes. Hart's own explanation of her innovative approach is worth quoting at length:

I am using what I call a relational concept of comparison that refuses to measure 'cases' against a universal yardstick. Instead of taking as pre-given objects, events, places and identities, I start with the question of how they are formed in relation one another. In this conception, particularities or specificities arise through interrelations between objects, events, places and identities; and it is through clarifying how these relations are produced and changed in practice that a close study of a particular part can illuminate the whole (Hart, 2002:15).

Accordingly, adopting a relational comparison approach entails moving away from 'searching for similarities and differences between two mutually exclusive contexts and instead towards relational comparison that uses different cities [or in this case water company areas] to pose questions of one another' (Ward, 2010: 480). With regard to the English water sector, this approach allows for greater consideration of how the trajectories of different regional monopolies are interconnected beyond their arbitrarily drawn boundaries and how approaches to metering are formed in relation to the emergence of other metering programmes. I have approached the case studies from the perspective that each company's metering approach has been, at least in part, informed and influenced by the experiences of other water companies; the boundaries between water company areas are then, to an extent, permeable. In this context, embracing the concept of relational comparison facilitates investigation of how metering policies in particular areas emerge in relation to other programmes and what these specific manifestations can reveal about broader processes surrounding the political ecology of water metering in South East England.

3.3 Research methods

Decisions regarding the selection of methods used have been influenced by the two schools of thought identified in chapter two, namely historical materialism and Foucauldian notions of governmentality. A combination of the following methods have been used: document analysis, semi structured interviews with policy makers and water industry representatives, participant observation, and semi structured interviews with households receiving water meters. Table 4 establishes how the chosen methods correspond with the research objectives outlined in the introductory chapter. Subsequently, an explanation of each method is offered.

Table 4 Relationships between empirical research objectives and methods

Research Objective	Method(s)	Corresponding Chapter(s)
How and why have compulsory water metering programmes emerged, from the perspective of some water companies and stakeholders in the sector, as desirable intervention sin South East England?	Discourse analysis, archival work, interviews with policy makers and industry representatives.	Chapter four and five.
How has the introduction of compulsory water metering influenced the ways in which water and water users are governed in the South East of England?	Document analysis, Semi structured interviews with policy makers and industry representatives. Participant observation.	Chapter six and seven.
What, if any, unintended outcomes have resulted from the introduction of compulsory water metering South East England?	Document analysis, Semi structured interviews with policy makers and industry representatives. Participant observation.	Chapter seven.

3.4 Discourse analysis

Discourse analysis is portrayed as a powerful methodological tool in geography (Dittmer 2009; Fairclough, 2003; Massey; Rydin 2005), albeit the exact role and transformative potential of the method is fiercely debated (see Lees, 2004). Discourse analysis speaks to both of the theoretical perspectives outlined in the previous chapter. This method can help describe how a set of rationales become dominant and how these versions of the "truth" are

produced, perpetuated and performed. Lees identifies two histories of discourse analysis, the first originates from the Marxist tradition and describes discourse analysis as 'a tool for uncovering certain… ways of thinking and talking about how things should be done that serve vested interests' (2004: 102). The second approach derives from Foucault's work on genealogy and uses discourse analysis to better understand 'how things and identities get constructed' (Lees, 2004: 103, also see Anais, 2012). Of course, these two trajectories are far from mutually exclusive, for instance Said's (2003 [1978]) *Orientalism* shows how these approaches are often mixed in practice through his application of Gramscian ideology critique and a post-structural exploration of discourse (Lees, 2004: 103).

This thesis takes inspiration from Foucault's work on genealogy to explore how compulsory companywide water metering programmes emerged, from the perspective of some water companies and policymakers, as a legitimate and desirable way of governing the waterscape. For Foucault, 'genealogy is a methodological process concerned with telling the story of how a set of discursive and non-discursive practices come into being and interact to form a set of political, economic, moral, cultural, and social institutions which define the limits of acceptable speaking, knowing, and acting' (Anais, 2012: 125). Indeed, Foucault (1997) noted that genealogy provokes questions regarding how certain ways of governing come to be. Here the focus of genealogical approaches differs from a historical one in that its task is not to trace events or practices from beginning, middle to end (Anais, 2012: 127). Rather, according to Foucault, genealogy 'disturbs what was previously considered immobile; it fragments what was thought unified; it shows the heterogeneity of what was imagined consistent with itself' (1977: 147). Within the context of this thesis, discourse analysis, primarily in the form of document analysis, is useful because it can help explain how specific rationales come to the fore, how they are retained and reinforced. Moreover, discourse analysis can be used 'to show how alternative geographies are foreclosed while the status quo is perpetuated' (Dittmer, 2009: 285).

In this context, document analysis is one of the key methods utilised throughout the research process. Following Silverman in his definition of "text", I use "document" to describe 'a heuristic device to identify data consisting of words and images which have become recorded without the intervention of a researcher (e.g. through an interview)' (2009:52). As Dittmer notes, 'if a researcher is interested in the ways in which knowledge is formulated and validated by society as truth, then discourse analysis is likely to be an excellent methodology

to use' (2009: 275). In part, this is because discourse analysis can highlight the 'non-obvious ways in which language is used in social relations of power and domination, and in ideology' (Fairclough, 2003: 229). Document analysis is, therefore, an appropriate method for developing a genealogy of metering and analysing the ways in which compulsory water metering has become a legitimate policy intervention.

There is an enormous amount of published textual data on water governance in England, as a result I had to be selective in the documents I chose to work with. This has, of course, has shaped the narrative of the thesis. I focused primarily on documents relating directly to metering that had been produced by government, actors within the water industry, CCW, the regulators and the popular press. The origins of the key documents that I have engaged with, in addition to those that are publically available from the water industry and donated or loaned by interviewees, are outlined in Table 5. Communicating how texts are selected is, as Dittmer suggests, 'important for demonstrating the rigor of the analysis' (2009: 28; also see Baxter and Eyles 1997).

Table 5 Document libraries and sources

Document source	Content
Public Utilities Access Forum Water Archives, Bishopsgate Institute: London.	I was informed by a former Secretary of the Public Utilies Access Forum (PUAF), Sean Creighton, that boxes of PUAF publications, meeting minutes and correspondence had been donated to the Bishopsgate Institute's Library in London.
The National Archives, Kew: London.	Water policy and planning documents, correspondence and minutes pertaining to water in the 1950s to 1960s.
The British Library: London.	Water policy and engineering documents 1840-1990.
The Water Demand Library, The Radcliff Library, Oxford University: Oxford.	This collection is constituted of approximately 1000 documents dating from privatisation until 2008; documents were originally kept by the UK National Demand Centre and constituted its Water Demand Library.

Document analysis in this project is not used as an end in itself. While useful to explore how certain ways of governing come to be dominant, document analysis alone, as Bakker notes, is insufficient to understand some the nuances of knowledge production in UK waterscape (1998). Therefore, it is vital that this method is combined with others in order to better understand how knowledge is produced and performed in practice. For instance, McDowell

has highlighted how interviews can be used, in combination with other methods, to 'probe an issue in depth' (2010: 157).

3.5 Water industry interviews

Interviewing "key informants" is a well-established tradition within human geography and across the social sciences more broadly (McDowell, 1998). Initially, I arranged a series of preliminary meetings with representatives from organisations that appeared prominent in existing literature; individuals who have been active in water debates in the UK and academics who are currently working on water governance in the UK. Ruming draws on ANT methods (though I would argue that this approach is far from exclusive to ANT as indicated by reference to snowballing in a large range of research methods text books), to argue that beginning a research project with a series of interviews sampled through a "snowball" technique can be beneficial. Firstly, it allows the researcher to begin to understand how different actors are connected in the sector and, secondly, this kind of interview process can be 'mobilised in an effort to validate... agency as a researcher and gain access to informants' through gaining credibility as an "informed" researcher (Ruming, 2009: 459). I found snowballing a useful way to meet individuals within the water sector that I otherwise would not have done. Especially since during the initial stages of the research, it became apparent that knowledge about water governance in England is focused in the hands of a relatively small number of individuals in the water sector.

Throughout the course of my research I interviewed 32 water industry officials, for a full list of interviewees see Table 6. Interviews were semi-structured, varied considerably in length and some interviewees were spoken with on multiple occasions. As McDowell (2010) suggests, in-depth semi structured interviews are useful because they can provide a more detailed and multi-layered picture of how and why environments are produced in particular ways. However, this kind of interview is not unproblematic for, as Rice points out, 'interviewing elites presents researchers with a number of practical challenges associated with the question of power' (2010: 70). Power, in this instance, should be understood as relational and it is this relational effect which can cause elites to 'restrict access and truncate critical social research', particularly in instances where the research material is commercially sensitive (ibid). In this context, Rice observes that the researcher is unlikely to retain complete control of the scenario and is often reliant on industrial or corporate elites who may

be sceptical regarding the commercial implications of the research. Here it is worth reflecting on Ruming's (2009) writings on the partiality of research and acknowledge that it is not always possible to access all the information the researcher would like to. McDowell explores these challenges in her work with merchant bankers in regard to the conflict between honesty, openness and gaining access to potential interviewees (2010: 164). She suggests that 'people are now more cautious and more savvy about being interviewed' (ibid). For this doctoral research, on the whole, interviewees tended to be extremely open and helpful. However, at times, concerns about commercial sensitivity or company image came to the fore and interviewees made clear that they did not feel able to openly discuss some issues.

In this context, the positionality of the researcher requires careful thought. In order to reduce the amount of possible obstacles faced, I thought carefully about how I would position myself, how I would explain my research objectives and how I would offer to share data (Rice 2010, McDowell 1998, Routledge 2008, England 1994). Indeed, it is now, rightfully, commonplace for researchers to recognise that 'they are not invisible, neutral entities; rather, they are part of the interaction they seek to study, and they influence the interaction' (Fontana & Prokos, 2007: 83, also see Rose, 1997).

The format of these interviews was largely dependent on the participants' schedule and commitments, some interviews took place in person, others over the telephone and I met with some interviewees multiple times. The majority were recorded and transcribed. Where possible I provided interviewees with a transcript of the interview for comment, this was extremely helpful because it allowed participants to clarify their viewpoints and highlights areas that they thought were unclear in the original interview transcript and, to an extent, relieved tensions surrounding commercial sensitivities. References to interview material have been anonymised due to the highly sensitive politics of water metering. Where interviews are cited directly, they are referenced in bold according to the date of the interview and the type of organisation the interview was with.

Table 6 List of interviewees

Organisation	Role of interviewee
Age UK	Policy Adviser, Consumer Markers (Utilities).
Citizens' Advice Bureau (CAB)	Social Policy Officer, Essential Services.
Chartered Institute of Environmental Health	Principal Policy Officer.
Consumer Council for Water (CCW)	Research Project Manager.
	Research Manager.
	Policy Manager - London and South East.
	Assistant Policy Manager South West England.
	Senior Policy Manager Affordability.
Energy Savings Trust	Water Strategy Manager
Frank Dobson MP	Former Shadow Secretary of State for the Environment.
Lord Deben (John Gummer)	Former Secretary of State for the Environment.
Fabian Society	Senior Researcher.
Greater London Assembly	Senior Strategy Manager and Assistant responsible for water policy.
Independent Researchers	Senior Researchers who work with water companies when delivering projects related to metering.
Ofwat	Metering Policy Officer.
	Smart Metering Lead.
	Water Resources Manager.
	Senior Manager responsible for affordability policy.
South East Water	Metering Manager.
	Communications Manager responsible for managing the metering programme.
South West Water	Service and Delivery Manger.
	Customer Research.
	Research and Policy Manager.
Southern Water	Metering Programme Manager.
	Communications Manager.
Thames Water	Metering Manager.
	Policy and Standards.
	Communications.
	Operations (metering).
	Metering and Leakage.
	Water efficiency.
Waterwise	Policy Officer/Researcher Water.

3.6 Household interviews

In addition to interviews with interested parties, I also interviewed 45 domestic water users in Basingstoke, which is in SEW's constituency and 15 households in London, TW's catchment area. Water users in Basingstoke, one of the first areas to obtain meters as part of its customer metering programme, had received meters shortly before the interview whereas many of

those interviewed in London did not possess a meter. Interviews were semi-structured and, although a number of key topics were covered each time, the structure of the interview enabled interviewees to pursue issues that were of greater interest or relevance to their situation. This allowed participants to shape the research process, the main implication being that more interview time was dedicated to discussing the relationship between metering and the cost of the water bill than I had initially anticipated. This in turn shaped of course shaped the analysis and the final form of the thesis.

For the most part, interviews were undertaken on a one to one basis. However, at times, interviews were conducted with multiple members of the same family or in small groups. Water use within the home can be deeply personal and in some cases the small focus groups allowed participants to 'discover shared experiences', or different experiences, in a safe environment (see Pratt, 2002: 221). Some of the more interesting discussions were borne out these interactions. Similarly, household interviews tended to be more vibrant when more than one member of the family was present; it tended to be the case that interviewees were more comfortable speaking about water use at home when in small groups. These interviews and focus groups explored residents' views on (compulsory) water metering, how they relate to water and how that might change given the installation of a meter.

Household interviews are a useful method because they can provide insight into 'how individual people experience and make sense of their own lives' as well as 'the meanings people attribute to their lives and the processes which operate in particular social contexts' (Valentine, 1997: 110). Considering that my research is in many ways concerned with the potential performative effects of increased metering, focusing on meaning, experiences and situated knowledge of water users is vital. This involves acknowledging that 'all knowledge is produced in specific circumstances and that those circumstances shape it in some way' (Rose, 1997: 305). As Haraway (1998) states, 'knowledges are limited, specific and partial' and it is important to consider how these particular knowledges are negotiated and articulated. The importance of exploring situated knowledges is emphasised by McDowell who explains the importance of adopting a method that allows people to 'construct their own accounts of their experiences by describing and explaining their lives in their own words' (McDowell. 2010: 162). I endeavoured to ensure that interviews were 'a dialogue rather than an interrogation' (ibid) and 'more of a collaboration than an interrogation' (McDowell, 2010: 162).

Recently, the extent to which interviews are an appropriate method to research everyday practices has been called into question. Some scholars, drawing on stronger forms of social practice theory, have argued that people are carriers of habitual practices, thus suggesting that people are incapable of critically reflecting on why or why not they adopt a particular practice (Reckwitz, 2002 – see chapter two for more on social practice theory). Hitchings (2012), challenges this statement. Instead, he argues that while it is sometimes difficult for people to talk about their practices in an interview situation, this does not mean that this approach is impossible or without merit. For example, in Hitching and Day's research with older people and comfort practices surrounding achieving domestic warmth in the winter, they argue that 'probing about why they might or might not, adopt alternative approaches, did help us work through their mundane actions together' (ibid). Hitchings concluded that:

Respondents could, and did, talk about their practices in various thoughtful ways and, whilst they could be reticent about discussing them with their peers, they would often quite like to. In any case, this group certainly did not feel themselves to be impotent 'carriers' of practices that forced them to reproduce unexciting suites of mundane actions with little personal reflection. Rather they were often alive to the potential for doing differently, and relatively keen to discuss this' (Hitchings, 2012: 65).

During the research process I found, for the most part, people were happy and fairly enthusiastic about discussing their practices and were generally interested in what other people do and think regarding water and water metering.

When interviewing households about their water practices, it is important to consider the positionality of the researcher. The researcher, as suggested above, is not neutral but influences the type of data that is produced. My role as researcher was tested at times. Some interviewees confused me for a water company employee, despite reassurance to the contrary and having presented university identification at the first meeting and at the beginning of the interview. These interviewees were hoping that I would be able to answer questions on behalf of the water company. When these situations arose, I made clear that I am an independent researcher and, as I am not affiliated to any of the water companies, I could not speak on their behalf. Where appropriate, I encouraged interviewees to consult the water company or CCW for further information.

3.7 Interview sampling strategy

Sampling is important because it in designing the sampling strategy, the researcher is presented with a number of decisions that will determine 'whose voices will be heard' (McDowell, 2010). For this reason 'sampling should be theoretically grounded' (Silverman, 2009: 143). This does not mean that sampling has to be fixed; the sample can evolve as the study progresses. As Baxter and Eyles highlight, 'who and what comes next depends on who and what came before' (1997: 515). For this research, it was most appropriate to target households in areas where meters were being installed at an early stage of SEW's ten year project because I was keen to hear about peoples' experiences of the company's customer engagement strategy as well as their attitudes to water use pre and post metering. SEW kindly provided a list of installation dates by postcode, this helped me to structure the sample more carefully.

I mapped Indices of Multiple Deprivation (IMD) data across Basingstoke and compared this to the meter installation timetable. IMD data was used because it gives a more nuanced representation of relative degrees of poverty as it considers variables, including income data, which are not accounted for in other surveys such as the census. The IMD data analysis output is also at neighbourhood level, thus providing a more accurate indication of relative poverty. However, this is only indicative as neighbourhoods often contain households in radically different circumstances. In terms of sampling I endeavoured to include: households situated across the IMD spectrum; a range of household types; a range of ages; a balance of male/female participants; people who would receive a meter under the compulsory scheme as well as a smaller number of people who had opted for a meter.

In order to recruit participants I tried a range of strategies with relative degrees of success. Initially I carried out a letter drop using a flyer that outlined my research and invited households to participate. I followed this up by door knocking and I also received emails offering participation from people offering their time for an interview. Take up using this method was relatively low. Attitudes to researchers approaching domestic spaces seem radically different in England compared to my previous experience in South Africa where, with a community leader making an initial introduction, residents on the whole tended to be much more open. In comparison English homes appeared closed off. For instance, an

interviewee I met at a water company event said after his interview that ‘to be perfectly honest you’re lucky that you spoke to us when you did, we don’t tend to open the door unless we’re expecting someone, you get so much rubbish through the post these days and people coming round trying to sell you anything and nothing’.

Seeking a greater number of participants I contacted managers of community centres in both Basingstoke and London, after I had explained my research, most allowed me to address group members before a session or club commenced. I also attended several metering drop-in centres organised by SEW and asked attendees to consider participating in the research. Recruiting in this way required a high degree of sensitivity; I had to ensure that I differentiated myself from the water company employees and exercised discretion when approaching attendees. The first drop in centre was attended by residents who were fairly sympathetic with the metering programme and were seeking further information, here participants were happy to arrange interviews. However, in the following session some attendees were visibly distraught, clearly it is important as a researcher not to cause or exacerbate distress so I decided that it would not be appropriate to approach these residents.

It was made clear that participants were welcome to withdraw from the research at any point and all material would be anonymised. Most interviews were recorded; however some interviewees indicated that they were uncomfortable with this, so in these cases hand written notes were taken. Interviewees were offered an opportunity to amend a transcript of the interview, very few respondents thought this necessary. However, it was important to offer, especially since the same opportunity was presented to policy groups.

3.8 Observation

In addition to document analysis and interviews, I accompanied SRN’s Green Doctors on three visits and recorded observations. Additionally, I attended several All Party Parliamentary Water Group meetings which are held in the House of Commons and chaired by the Conservative MP Anne McIntosh. These meetings usually consist of panel discussions followed by a question and answer sessions and are attended by a range of stakeholders including MPs, water companies, regulators, suppliers, advocacy organisations, unions, academics, business representatives and consultancy organisations. Moreover, observations were made at conferences, meetings at Defra about the future of SRN’s metering programme,

CCW's quarterly public meetings and SEW's drop in centres for its metering programme. Observation became a key means of better understanding how policy is negotiated and relationships between organisations are performed as well as how some elements of policy are implemented in practice (Flick, 2009). Observations were recorded in a research diary.

3.9 Limitations

The main limitations of this thesis relate to questions of access. The popular press tends to react negatively to news that companies are considering metering programmes; metering tends to be presented as a punitive tax on the poor. Considering the unprecedented scale of the metering programmes, and the corresponding change to the way water charges are structured, policy makers were cautious about how these programmes would be presented by researchers and journalists. Negative press coverage could have serious implications for the acceptability of future metering programmes. The sensitivity of water metering meant that it was sometimes difficult for interviewees to speak frankly and, at times, arranging interviews with senior policy makers proved difficult. This was especially true of government figures. Of course, these access issues shaped the narrative of the thesis.

There were also challenges in recruiting participants for household interviews. When conducting qualitative research it is common for water companies and other organisations to pay participants around £100 for their time. Clearly it is not possible to provide this sort of incentive within parameters of a doctoral project. Moreover, ethically, it is not desirable. As a result of difficulties in recruiting participants, the sample is skewed in favour of those who tended to be at home during the day and used community services. Consequently, those who have retired and women with young children were overrepresented in the sample. As a result, data from these interviews should be treated with caution and definitive statements about broader trends should not be extrapolated. Nonetheless, the content of these interviews provided interesting insights into how these households engaged with water and compulsory metering.

The politicised and high profile character of compulsory metering also influenced content of household interviews. Although the interviews were semi structured, and therefore were organised to be responsive to the interviewees' interests and experiences, key topics were included in the interview script. These included questions about how participants used water

at home; their water practices; how they perceived the local environment; impressions of compulsory metering; and what, if anything, they might change following the introduction of the meter. However, these topics were covered unevenly on occasion because some interviewees were anxious about the impact that a metered charge might have on their water bill. As a result these interviewees were more interested in talking, and asking questions, about the introduction of metering and the potential bill impact rather than the other topics. This could be partially addressed in the future by changing the way the research is communicated to participants and placing greater emphasis on water practices rather than metering specifically. However, it was important to be honest about the aims of the research. While, ideally, it would have been preferential to cover the topics more evenly, the interviewees' focus on the financial aspects of metering provided insight into some of their key concerns and consequently shaped the contours of thesis.

The final difficulty also makes this doctoral research interesting; compulsory metering is happening in the contemporary moment. This means that information about aspects of the programmes, particularly with information pertaining to affordability mechanisms, has changed rapidly throughout the course of the research. Debates around water affordability have also been undertaken in the context of high profile parliamentary and public discussions about the affordability of energy. Recently, government has made multiple announcements about energy affordability and there have also been calls for the government to take further action regarding water affordability. These debates are ongoing yet the thesis draws a line at October 2013. All material is up to date and accurate at the time of writing.

3.10 Analysis – translating research into a thesis

Most interviews [are] pure twaddle and valueless… Now, in your interview, you have certainly been most accurate; you have set down the sentences I uttered as I said them. But you have not a word of explanation; what my manner was at several points is not indicated. Therefore, no reader can possibly know where I was in earnest and where I was joking; or whether I was joking altogether or in earnest altogether. Such a report of a conversation has no value. It can convey many meanings to the reader, but never the right one' (Mark Twain in Paine, 2007).

The final research output reflects the network of actors the researcher has been able to access. It expresses how research participants and documents have been engaged and, importantly, it reflects how the researcher decides to interpret, present or suppress their findings (McDowell, 1998). The network we translate is, therefore, different from that which we enter in the first place and in some senses, the researcher is in a powerful position in translating research. All research is, therefore, a process of translation told by a particular person, at a particular time and to a particular audience (McDowell 1998; Ruming, 2009: 451; Cowan et al. 2009). I tried to ensure that the final thesis reflected not only the content of interactions accurately but also the spirit.

This was partly achieved by sharing transcripts with interviewees as discussed above. Sharing these transcripts provoked a conversation with participants about the interview material and provided a clearer indication of how the data should be represented. This helped to ensure that the final thesis reflected the spirit of interactions with participants. The thesis also uses direct quotes as frequently as possible to help ensure that data is presented clearly.

The data collected through interviews, observations (which were recorded in a research diary) and document analysis were manually coded. The coding method is important because it, in part, determines what themes the researcher focuses on and, accordingly, the eventual shape of the analysis. I began by identifying a series of broad themes across the data, deliberately keeping an open mind so my approach was flexible enough to allow particular themes and sub-themes to emerge in the participants' words. Cope argues that this flexible approach 'allow[s] the data to "speak"' (2010:444). Here, as researcher, it is important to reflect on codes as they emerge and consider how these codes relate to existing literature. I coded interview data by hand, creating a database of key themes. This enabled me to situate quotations and ensure that the final quotations used in the thesis were representative of the broader data. The process of coding then becomes an instrumental way of analysing data and is vital in ensuring that the evidence used in the final thesis is representative of the data collected. Information from transcripts, field notes from interviews have been triangulated with published documents where possible to improve credibility and validate the data where appropriate.

4 Measuring fairness? A genealogy of water metering (1840 - 1960)

4.1 Introduction

Water metering is often treated as an adjunct to debates about institutional change (Hassan 1998), regulation (Bakker 2004) and shifts in supply/demand management strategies (Walker 2013) in the water sector. This and the subsequent chapter provide a genealogy of water metering in England in order to better understand how companywide compulsory water metering has emerged as a desirable technique to govern the waterscape in South East England. The two chapters draw on Foucault's genealogical approach to trace how water metering programmes, in its various guises, have been used to negotiate different ways of understanding the waterscape with respect to governing the conduct of individuals and regulation of the population more broadly.

This chapter teases out how the meter has been used to help express and negotiate different understandings of fairness and waste between 1840 until 1960. In doing so, this chapter builds on Drakeford's (1998) work on the more draconian aspects of prepayment meters and disconnection in the 1990s, Knamiller and Sharp's (2009) work on the relationship between compulsory metering and trust and Trentmann and Taylor's (2011) work the relationship between debates over household metering and the onset of consumer politics in the early twentieth century. Importantly, meanings and measurements of fairness and waste have been constantly renegotiated through water metering since 1840. Chapter five then examines how the meter has been used to renegotiate the waterscape from 1960 until 2009. Here it is important to reiterate that this chapter is not a *history* of metering; it does not trace the story of metering absolutely from beginning to middle to end. As discussed in chapter three, genealogy, closely linked to Foucault's work on governmentality, is a:

Methodological process concerned with telling the story of how a set of discursive and non-discursive practices come into being and interact to form a set of political, economic, moral, cultural, and social institutions which define the limits of acceptable speaking, knowing and acting (Anais, 2012: 125).

In constructing a genealogy of water metering, this chapter seeks to provide the means to launch an investigation of what Foucault referred to as 'the "history of the present" by 'mounting an organised assault on the intellectual object that we take history to be and by unsettling and disrupting the political and intellectual grounds upon which we rest our inquiries' (Anais, 2012:126). It considers what the story of water metering in England can tell us about the emergence of contemporary companywide compulsory metering programmes. In doing so, reflecting on theories of governmentality, the chapter reveals a recurring conflict between economics and biopolitics where the biopolitical political need to secure life through a constant supply of affordable water is often presented as being, to an extent, antithetical to paying for water by volume. In this context, the meter is taken as an important artefact through which understandings of fairness in the waterscape are negotiated and renegotiated.

This chapter begins by exploring the emergence of the waste water meter as a means of securing and managing the biopolitcal problem of constant supply in the late 19th Century. It argues that the meter played an important role in securing and regulating the water network. Subsequently, building on Trentmann and Taylor (2005), calls for a 'right' to household metering are considered alongside debates surrounding the (in)justices of metering in the context of rising unmeasured water prices. This section explores how the object of the meter shifted from the physical network to household consumption, focusing on debates over the competing notions of fairness present in metering debates. The chapter then moves to position the meter as a means of defining and delineating what is understood by 'normal' and 'domestic' supply at the turn of the 20th century; here water metering became, for a relatively short period of time, a politically salient issue. Overall this chapter teases out how the water meter has been utilised to help frame and, in part, constantly renegotiate different understandings of fairness and waste in relation to water from the late Victorian period to 1960. In this context, the water meter has played an important role in producing the socionatural waterscape and setting in motion a debate that placed securing public health through an affordable supply of water at odds with forms of economics which privileged paying for water by volume.

4.2 Vital biopolitics and the problem of constant supply

Although sanitation had been a matter of concern for government since medieval times, the 'heroic' exploits of Victorian water engineers in realising constant supply during 1870-90 represented a pivotal moment in the history of water supply in Great Britain (Marvin and Guy 1997). Some have described this moment as an 'urban revolution' (Wohl 1983). In particular Edwin Chadwick's *Report on the Sanitary Condition of the Labouring Population of Great Britain* (1842) and Sir Joseph Bazalgette's system of 'intercepting sewers' (Halliday, 2001:4) were vital in 'cleansing, clearing, paving, draining and ventilating' the city (Joyce 2003: 63). Victorian water engineers were successful in convincing politicians of the importance of technological solutions. Individual bodies became increasingly connected to the city through the water network, for instance through the introduction of new technologies such as water closets. In doing Victorian water engineers forged a 'hydraulic society… which conceived… the city as a place of flows and, movement and circulation' where 'vital processes' had to be secured and disease tackled (ibid). This should not be read purely as philanthropic exercise but a securitisation strategy or, in other words, 'a means of preventing disease in order to save on outlay on the Poor Law' (Osborne, 1996: 104). Disease in this context was considered to be 'wastage' (ibid). Here, Joyce insists that the 'care of the city and health of the body were one' (2003: 65).

This reworking of the water supply system is best understood as a biopolitical process, a system of 'vital regulation', where government intervenes, in this case through the engineering of sanitation solutions and the introduction of constant supply, to secure life (Osborne 1996: 100; Bakker 2012). It is important, however, not to overstate the networked nature of the water system. Although legislation in 1847/52 'compelled water companies to provide water for domestic supply', constant supply of water emerged 'slowly and unevenly' after 1860. As a result, 'people in neighbouring streets and districts had radically different experiences as users, subject to different hours, quantities, standards of supply and prices' (Trentmann and Taylor, 2005). This level of fragmentation indicates that water supply in England and Wales had not achieved the 'modern infrastructural ideal' described by Graham and Marvin in their Splintering Urbanism thesis (2001). At this point a plethora of water providers, public and private, were operating in England. Although the number is greatly reduced compared to the Victorian era, there were still over 1000 water undertakings registered in 1950. The story of the radically reconstituted networked water system in Britain

is well documented (Hassan 1998), less well told is the relationship between metering and the emergence of constant supply. This relationship is imperative because it helps establish a series of principles that, as this chapter demonstrates, will continue to be struggled over one hundred years later.

4.3 Securing and Re-ordering the Network: the waste water meter

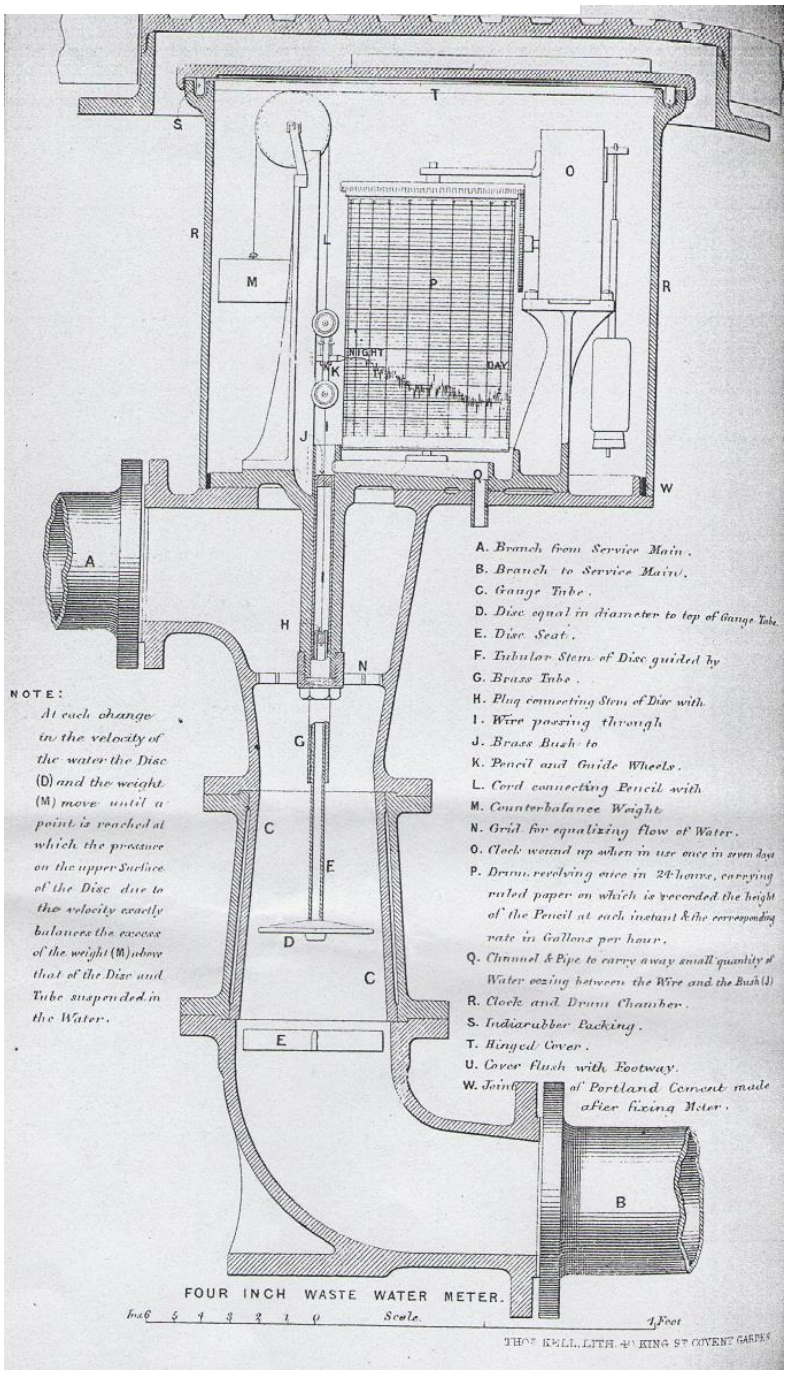
The invention of the Deacon Waste Water Meter in Liverpool (1870, see Figure 4) highlights an important juncture in the history of water supply governance in the England and Wales; it represents a key moment when water waste became a matter of concern for government. In addition to achieving constant supplies of water, engineers, water companies and politicians began to become concerned with notions of water 'waste' and measures to reduce it which, in turn, would secure the water network. There is, of course, no objective definition of water 'waste'. Particular understandings are socially and historically determined. In this context water 'waste', typically, referred to water lost through leakage rather than perceived wasteful or high volume water practices. Engineers and politicians were united in a common goal to defend England's recently acquired title of 'the home of hygiene' (Joyce, 2003: 69). As Taylor and Trentmann (2011) have emphasised, the introduction of constant supply is directly linked to the emergence of metering.

Although the quest for constant supply elevated water to a matter of concern for government, the goal of achieving constant supply should not be confused with support for free-flowing, unregulated water supplies. When giving oral evidence to the 1886 Royal Commission on Water Supply, an engineer from the Kent Waterworks Company was asked whether, in his opinion, 'constant supply would be a very good thing?' To which he responded: 'I do, if we could at once prevent waste, or if we had power given to us to prevent it, or any system were devised by which we could rid of the enormous waste which is attendant upon a constant supply as carried out under the present system' (HC 1886, col. 497). In this instance it is clear that water had not 'always behave[d] the way humans had hoped' (Joyce, 2003: 15; Bakker 2004 later coined the phrase 'uncooperative commodity' to describe this phenomenon). Support for constant supply was conditional upon waste reduction strategies. The waste water meter became a means of subverting the controversy introduced by constant supply by making waste more visible and then, along with new pipes, fixtures and sewers, making it less unruly in an 'attempt by humans to make matter perform' by ordering and securing the

water network (Joyce 2003: 15). Reflecting back on Foucault's concept of governmentality, the Deacon Waste Water meter was not employed to influence the self-conduct of water

users, instead metering operated at the district rather than household level. Here the Deacon Waste Water Meter became an important biopolitical tool and was implemented to secure life by disciplining the physical water *network* rather than the population per se.

Figure 4 The Deacon Waste Water Meter



While contemporary companywide compulsory water metering programmes are located in South East England, the Waste Water Meter was invented in North West England by Mr G F Deacon, an engineer to the Liverpool Corporation.[11] According to Watherston (1876), the waste water meter was 'devised and adopted for the discovery, suppression and prevention of waste' (p. 3). This meter differed from more blunt instruments 'which merely count[ed] the number of gallons passed between any two observations' because it also recorded 'on a diagram, the rate of flow at each and every instant' (ibid). Its inventors claimed that meter readings could be used to differentiate between the water *wasted* and the water *used* (see Figure 5 for an example). Interestingly, waste was identified as water lost in the network, for instance through 'improper fittings' and leakage, rather than the result of the actions of individual households. Watherston argued that

It is obvious that when water being drawn off for use in such a district, the rate of flow from minute to minute must be variable, and this is accordingly shown by the irregular vertical lines from noon to 11pm. And from 5 am to noon. When waste alone is taking place, the flow must evidently be uniform, and the condition is indicated by the comparatively uniform and horizontal line from 2 to 5am. Only occasionally is water drawn during the night (1876: 4).

Following the installation of a waste water meter system, water waste could be monitored carefully. The water network was divided into a number of districts and the net population of the district was ascertained. From this information an estimate of the average waste per head per could be obtained by a simple calculation. Readings were taken for the meters every three to four days and the information from the meter could be used to identify the 'most wasteful' districts which would then, in turn, inform the activities of the Night Inspector. After 11pm a Night Inspector would visit the 'most wasteful' districts and inspect the stop cock using a wooden rope and stethoscope, leaving open those where he heard running water and recording the waste in his report book. The following morning a Day Inspector, accompanied by a labourer, would visit the marked properties to examine the fittings and pipes in order to determine the source of waste. According to Walker

Any minor causes of leakage, such as worn leather, or other defect which can be repaired in a few minutes at the time, without interfering with regular plumbers work, is set to rights

[11] Perhaps it should be no surprise that the waste water meter was developed in Liverpool for, according to Hassan, 'water was so scarce in Liverpool that begging for it was common' (1998).

gratuitously by the Day Inspector, whilst notices to repair or renew are only issued to the owner or occupier in graver cases (Walker, 1883:4-5).

During the same day, the diagram produced by the water meter was consulted to measure the flow of water, the accuracy of the Inspectors' report was checked and the 'proportion of the whole waste of the district' that he had detected would be calculated (ibid). Here the meter became a key way of managing the security of the water supply network. In tackling waste, emphasis was placed on the workings of fixtures and fittings, the quality of which was bemoaned by engineers, rather than the water use practices of individual households. In this context, one Member of Parliament concluded that 'the success or failure of constant supply depended entirely upon the state of the fittings in a house. Unless they were in good order a frightful waste occurred' (Mr Coope, HC 1875, col 874-94). Interestingly, while some engineers were sceptical that the habits of household water users could be altered, others argued that it would be necessary to establish a 'water police'. The 'water police' would regulate household water use but a Royal Commission report concluded that 'the public would not bear' it and so the introduction of a water police was considered to be 'perfectly out of the question' (Royal Commission 1885).[12] Addressing inefficient fixtures and fittings was perceived as a more realistic and politically palatable solution.

The architects of the waste water system made fantastic claims regarding the advantages posed by the waste water meter system. First and foremost the meter could help reduce waste (see Figure 6 which shows the record of water flow before and after an inspection). It was claimed that the waste water meter system would bring water savings of between 25 and 100 per cent compared to ordinary inspection. Moreover, the meter was described as a 'labour saving technology' for it economised inspector's time and would require fewer staff to operate than the inspector system. Nevertheless, it is clear that the waste water meter system was not universally welcomed across the myriad of water companies, both public and private, that were in operation during the late 19th century. For example, the engineer for Croydon Water Works Report advised against the adoption of the waste water meter system due to the expense of meter installation; a reason that would be frequently cited over the course of the next century (Walker 1883). Instead he advised the company to continue to employ

[12] The notion of a water police has some resonance with the Green Doctor service provided by SRN in the contemporary moment and is explored in chapter seven.

inspectors in order to carry out waste detection without the technical support offered by the meter.

Despite concerns expressed by some water providers, notions of waste reduction and labour saving were sustained in the dominant discourse surrounding metering. For example the adverts below (Figure 7) from the Water Engineer's Handbook clearly show that these ideas and concerns about network security had become prominent. What is clear is that the advent of constant supply made water (and water waste) a matter of concern for government. In this context, water providers sought ways to better control the flow of water and the Deacon Waste Water System was introduced in an effort to reduce water waste. This technology was designed to support and secure new constant supplies of water by monitoring the network rather than individual water use practices. Importantly this was done with the conscious intention of protecting England's newly acquired reputation as the 'home of hygiene' thus emphasising the importance of water and water metering as biopolitical problems. This way a key moment in the process of the governmentalisation of the state; securing life by ensuring a constant, safe and affordable supply of water became a core concern for the state.

Figure 5 Measurements from the Deacon Waste Water Meter

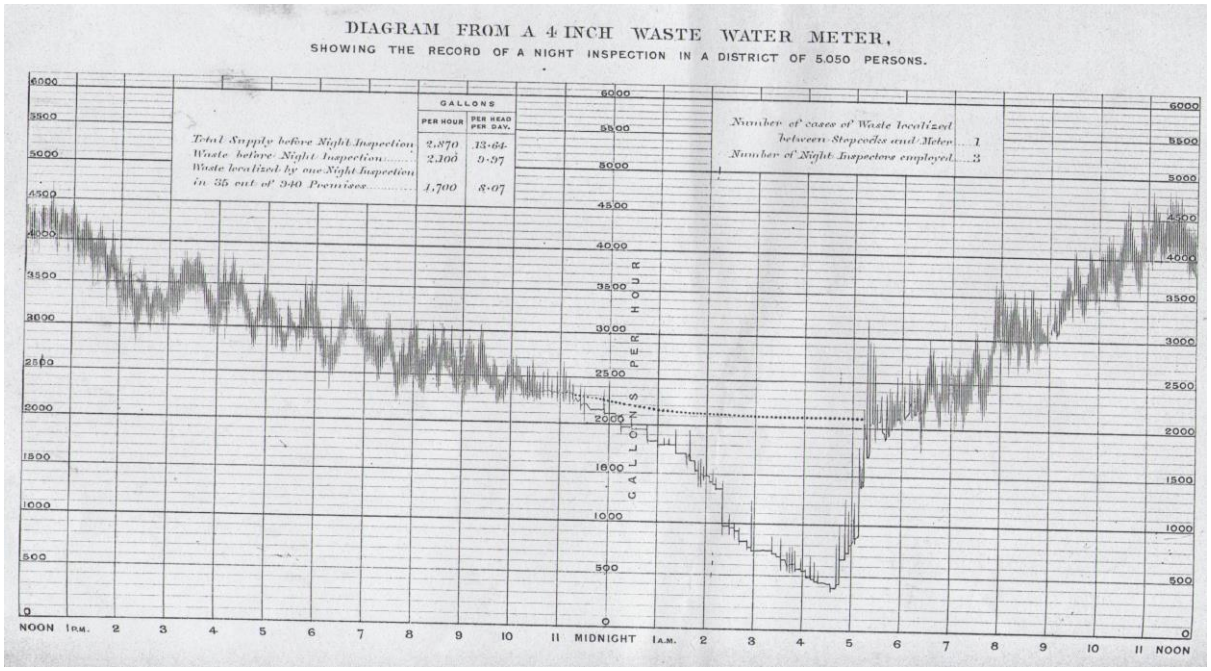


Figure 6 Diagram from a Deacon Waste Water Meter: before and after inspection

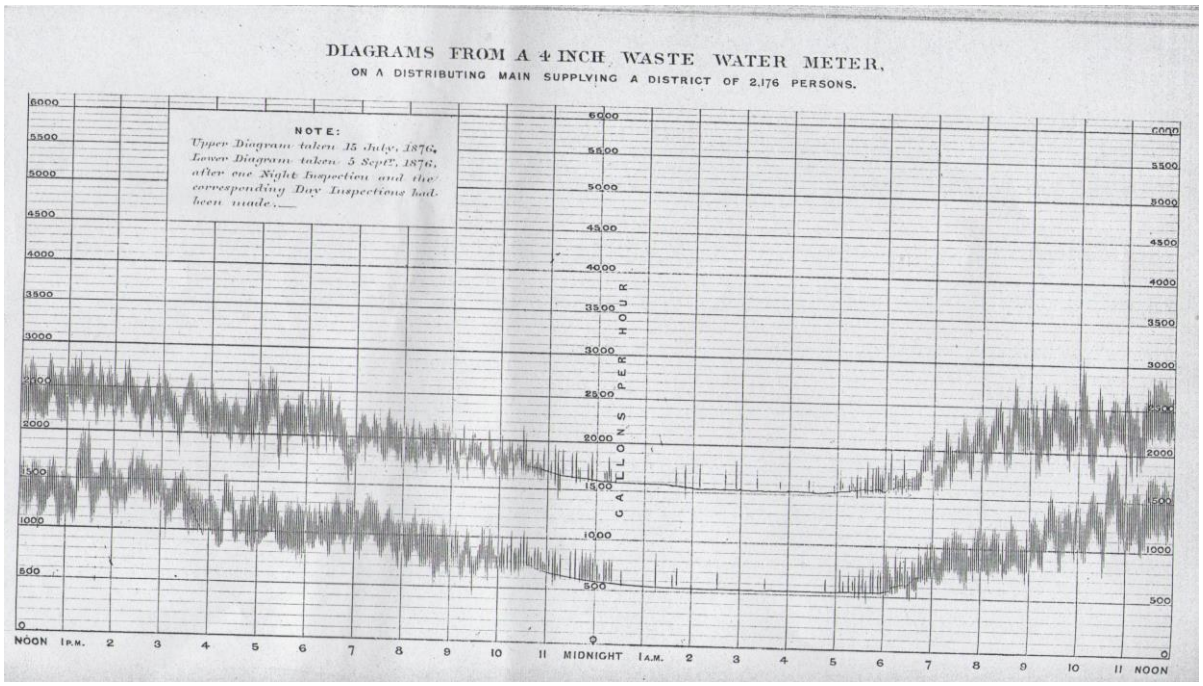
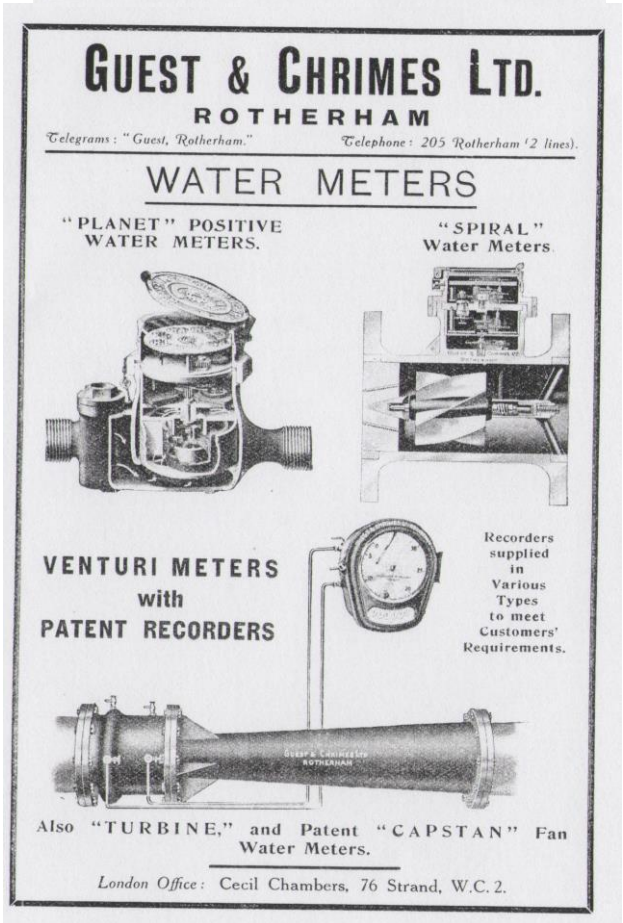


Figure 7 Adverts for meters (Source: Water Engineers' Handbook, 1930 & 1931)



4.4 From pipes to people: The 'right' to a meter and the (in)justice of water metering

Although households were not initially metered in the 19th century, businesses were. There are two main reasons for this. Firstly, the cost of supplying meters to industrial bodies was far less than to households. Secondly, industrialisation had triggered rapidly rising water consumption in Victorian cities and, as a result, water providers were keen to ensure that the cost of supplying water to commercial organisations was recouped (Royal Commission, 1885). In contrast, households, or at least those who had access to constant supply, paid water rates. These were configured on the basis of estimated consumption which, in turn, was calculated according to property size. Water rates differed radically from one water provider to another. From the 1850s the way that water charges were constructed altered. Instead of property size, annual property values became the basis of the charge, thus bringing water in line with other local taxes (Trentmann and Taylor, 2005).

The change in the way water rates were articulated was met with scorn from some Ratepayer Associations. This, in turn, stimulated a broader debate over household metering. In particular, the actions of Archibald Dobbs, a prominent Barrister and a member of the Islington Rate Payers Association, helped to shift the object of metering from pipes to people. His activities are important in the context of this genealogy of water metering for three main reasons. Firstly, his legislative battle and claim to the right to a metered supply elevated the political interest in metering and helped instigate the emergence of a new consumer culture (Trentmann and Taylor, 2005). Secondly, Dobbs was directly involved in Luton based George Kent Ltd's decision to adopt water metering into its business. Finally, and most importantly, Dobbs' activities brought to the fore a debate about equality and water metering that would continue to rage on for over one hundred years.

In 1882, Archibald Dobbs brought a test case against the New River Company which operated in North London. Dobbs objected to the introduction of property valuation to determine water charges, arguing that the re-articulation of the system, and the resulting rise in the water rate, resulted in companies overcharging customers and thus violating the customers' private property rights (Trentmann and Taylor 2005: 64). Dobbs took his case to the House of Lords and won. This was perceived to be a disaster for the water company, not least because of the fiscal implications but because the decision involved a 'great question of

principle' (ibid). Here 'the House of Lords had decided that the Water Companies had been charging far too much' and water customers needed to be protected from the vampire-like behaviour of the private water companies (Trentmann and Taylor, 2005: 64). Dobb's case formed the foundations for a series of active (if relatively short lived) Consumer Defence Leagues established to protect consumer interests (ibid). In this context, Kent argued that domestic water users were 'agitating' for metering; meters were perceived as a key means of preventing further price rises (1982: 94, chapter six explores the relationship between metering and control over the bill in the contemporary moment).

Dobb's court case was also important because it contributed towards George Kent's decision to include the manufacture of water meters as a core part of his business. George Kent Ltd would later become Elsevier Metering, one of the largest water meter companies with considerable global reach. Kent had first entered the business world as a blindmaker and, prior to adopting the meter, his firm was considered to be a pioneer of domestic 'labour savings technologies'. The business was most renowned for the rotary cleaning knife and the domestic refrigerator or 'ice safe'. It was somewhat fortuitous for George Kent that the water meter arose as a viable business venture considering that the ice box and the cleaning knife had been 'more or less relegated to the limbo of the past' (George Kent Ltd, 1938).

Water meters were first included in the business in 1883. An employee of George Kent Ltd, Mr J.W. Sutton, had followed the Dobbs' case with considerable interest. Sutton approached Dobbs and the two men met frequently to discuss 'the question of the want of equity, so far as the customer was concerned, in charging by the rate instead of by quantity… and the idea of substituting the water rate eventually directed Mr Sutton's thoughts towards water meters as a possible branch of the firm's business' (George Kent Ltd 1938). Subsequently, the firm bought the rights for the Meinecke Inferential Meter, which had won a silver medal at the Interventions Exhibition in 1885, and the world patents for a semi rotary meter (ibid). After steady growth, business began to boom and by 1938, in the relative absence of a large domestic market, George Kent Ltd developed its business overseas and won a Queen's Award for 'export achievement in the Mechanical Meters Division'.[13] While household

[13] As will be explored in greater detail below, the operations of George Kent Ltd would become important in shaping the development of household water metering in England in the 1960s.

metering represented a considerable expense for water companies, for George Kent Ltd and other manufacturers water metering represented a lucrative business opportunity.

Significantly, the discussions between Dobbs and Sullivan represent a diversification of the meanings of equity beyond the tax and property based models in use at the time. The meaning of equity in relation to water was hotly contested in Parliament with the exchange reaching its apogee in 1884 with the Metropolitan Board of Works (Further Powers) Bill.[14] This bill would have provided the legal means for customers to demand a metered charge and, effectively, the right to a meter (if the customer was willing to pay for its installation). The provisions in the bill were not reciprocal, meaning that water companies would not be able to force households to take up meters. This is important; protagonists of the new clause were not forwarding an agenda for *compulsory* metering but *optant* metering where households could request a metered supply. Calls for optant metering were very much tied up with a specific understanding of equity or fairness that privileged private property rights. As Trentmann and Taylor (2011) convincingly explain, calls for a right to a meter spurred the development of consumer politics and a shift in the relationship between water user and provider. The clauses under consideration prompted substantial debate regarding meanings of fairness in the context of water supply. In this sense debates over metering revealed conflicting understandings of fairness that juxtaposed biopolitical concerns over constant, affordable supplies of water in opposition to economic arguments for metering where households would be able to pay for water by volume.

Sir Thomas Chambers, Member for Marylebone, who introduced the second reading[15] of the 1884 Bill, told the House of Commons that the existing system based on rateable values was unfair because prices, which rose according to property values, bore no relation to the quantity (or quality) of water received. Chambers noted that he 'could not remember another instance of an article bought and sold, where the price charged had no relation whatever to

[14] The Municipal Board of Works had also taken up the case for metering in 1875 (Trentmann and Taylor, 2005: 70).

[15] Second reading is an early stage for a Bill to be defeated in the UK parliamentary process. Normally a Bill is not debated at its first reading; this is just a formal introduction. At the second reading Members of Parliament are able to debate the main principles of the Bill, at the end of the debate a vote takes place to determine whether the Bill should proceed to the next stage. If the Bill does proceed, a Committee normally analyses each clause line by line and any amendments to the Bill are debated. The Bill is then returned to the floor of the House (report stage) so that any amendments made in Committee can be considered. The Bill is then read for a third time and debated. The same process then takes place in the House of Lords and, finally, both Houses are invited to consider any amendments that have been subsequently made.

the quality of the thing sold'. He told the Commons that 'the Bill proposed to give the customer power to say to the Water Companies – "I will take my water by measure, and I will pay for it according to the quantity I consume"'. He argued that 'surely nothing could be fairer than that' and suggested that in 'certain cases in which it would not be fair – as, for instance, where the quantity taken was very small, and the cost of supplying it larger than the average', a Select Committee would 'inquire into and settle' the matter (HC 1884, vol 285 col 1200).

These particular understandings of fairness were far from universally accepted. For example, Sir Henry Holland, Member for Hampstead, argued that 'in the first place, it was by no means clear that the meter system for all purposes (trade and domestic) would work well from either a sanitary or economical point of view' (1884, vol 285 col 1212). Again emphasising the perceived potential threat of the economics of metering to the biopolitical health of the population. Drawing on evidence from the cities of Liverpool and Manchester, Sir Henry Holland argued that

The poor would lose, while the rich would gain… where a poor man was now charged from 6s. to 8s. per annum, he would have to pay, under this Bill, a minimum charge of 12s. per annum, to which must be added the charge for the meter (HC 1884, vol 285 col 1197 - 1243).

Sir Henry Holland concluded that he was 'justified in saying that this was a Bill to relieve the rich at the expense of the poorer classes' (HC 1884, vol 285 col 1197 - 1243).

Debate over the proposed Bill is illuminating as the question of fairness and the anticipated costs faced by the water providers proved to be considerable sticking points to introduction of optional metered charging (contemporary water companies in South East England faced similar conundrums regarding the relationship between compulsory companywide metering and equity, see chapter six). The Bill was originally promoted by the Corporation of London who proposed that the 'whole water supply of the Metropolis should be by meter, at the option of the tenant, at a charge 6d. per 1000 gallons'. Members on both sides of the house showed concern that water metering would be 'highly unjust and unfair to the water companies, and it would be oppressive to the ratepayers' (Mr Coope[16], Member for

Middlesex, HC 1884 vol 285 col 33-51). This was because the cost of meter installation would be met by the customer and thus would present a prohibitive price increase for some households. The House drew upon evidence from Berlin's experience of domestic water metering.[17] Coope claimed that 'the only town of any size supplied by this principle [by meter] was Berlin and there the charge of water was about three times as much as that proposed by the Corporation' (HC 1884, vol 285 col 33-51). Members argued that the poor would face a disproportionate price burden and would be forced to reduce their water consumption. As a result, Members expressed concern that the poor would pose a public health threat. Coope's statement is indicative of the tone of the debate and is worth quoting at length:

The water rate was obviously a tax upon property, and it was so arranged that the poor should receive full benefit at the expense of the rich. The water companies had felt that it was their duty to meet the wants of the poor in that respect. If they attempted to supply water by meter, they would at once considerably curtail the quantity of water the poor would get. At present, every small house received a supply from the water companies of 66,000 gallons per annum. According to the Corporation Bill, they would receive only 24,000 gallons per annum, or a little more than one-third; but the charge to the poor would be 3s. per quarter, and 3s. was the lowest charge for the use of the meter. Therefore, the total charge would be 15s. a year; whereas many houses now supplied by the water companies did not pay more than from 8s. to 10s. a-year; so that it was evident that, while the poor would be robbed of a considerable part of their water supply, they would have to pay a great deal more for it.

[16] Interestingly Mr Coope, a Teller for the Noes – meaning that he was one of four people responsible for counting the votes and announcing the results to the House – was also the Director of a Metropolitan Water Company. One Member, Mr Firth, raised a Point of Order, highlighting that Coope had 'a direct pecuniary interest in the Question before the House' and thus called into question whether it was appropriate for someone in that position to hold conflicts of interests on that scale. Given that water companies were thought to be making considerable profits as a result of annual increases in rateable valuations, concerns about Coope's impartiality were warranted. Initially Mr Firth called for Mr Coope's vote to be discounted, however after debate and guidance from the Speaker as to the public importance of the legislation being debated, the request was withdrawn.

[17] Berlin did in fact meter households. A footnote in Walter Kent's (1892) *The Water Meter, It's difficulties, types and application: a manual of reference and fact in connection with the supply of water by meter,* states that: 'Berlin is supplies with water entirely on the meter system, the supply having been found inadequate under the rating method; the meters are all inferential; the supply is constant without cisterns. Owing to the fact that each house contains a number of families living in flats, each meter supplies water for an average of sixty-seven people; small flows are therefore very exceptional. The results appear very satisfactory' (p.53).

While Archibald Dobbs had argued that the introduction of metering would enable customers to avoid what he perceived to be unjust taxes like water rates, at this time the dominant position among Members of Parliament was one of resistance to domestic metering. Parliamentarians feared that the introduction of a metered system would result in a larger financial burden being placed on the poor. Overall the House concluded that 'the establishment of a general meter system would be an unfortunate thing for London' (Mr Firth, Member for Chelsea HC 1884 vol 285 col 1197 - 1243). This was because, according to Mr Henry Wiggin, Member for Handsworth, 'the adoption of a system of supplying water by meter would compel the people very materially to reduce the consumption of water' (HC 1884, vol 285 col 1197 - 1243). In turn, this would pose a threat to the relatively high health and hygiene standards achieved through a combination of interconnected sewerage networks and the circulation of water. Indeed, Mr Wiggins begged the House 'to recollect what had made London one of the healthiest cities in the world' (HC 1884, vol 285 col 1250). Rather than placing pressure on households to reduce their water consumption, Firth suggested that 'the more water is consumed in the cleansing of houses and in bath-rooms, gardens, and so forth, the better it is for the public health and sanitary condition' (ibid). Here any potential restricted water flow was associated with the increased prevalence of dirt and disease, metering therefore posed a threat to the health of individuals as well as the population at large. Sir William Makins, Member for South Essex, argued that

In a crowded City like London they had more to fear from dirt than dynamite, because dirt meant disease, immorality, and drunkenness. There was no surer way of producing disease than by the generation of sewer gas, and the only way of preventing the generation of sewer gas was to provide a copious and plentiful supply of water, such as that which was supplied at present (Makins, HC 1884 vol 285 col 1450-69).

Overall, there was little appetite within parliament to sanction any movement towards the establishment of a metered water charging system; the Bill was defeated at its second reading. The Noes took a 199 Majority with 235 to 36 votes. However, despite this significant loss, debates over metering did not disappear. For example, in 1885, the House of Commons considered amending the 1847 Waterworks Clauses Act to include a new clause that would permit the Supply of Water by Meter. The new clause, "Supply of Water by Meter", was raised by Daniel Grant, Member for Marylebone, at the Committee stage yet the proposed clause was considered outside the scope of the main Bill and was not debated.

While there was no consensus regarding the merits of metering, clearly interest in metering had not waned, as did the antagonism between economics and biopolitics in the context of metering.

The issue of metering continued to occupy legislative time in Parliament. In 1890 the London Water (Meter) Bill, proposed by Mr Gainsford Bruce, Member for Finsbury Holborn, would have provided for the 'supply by meter of Water for domestic purposes within the limits of supply of the London water companies' (HC 1890, col 104). This proposed measure was introduced alongside two other Bills; the Metropolitan Companies Charges Bill and the Metropolis Water Supply Bill with the intention that all three, and thus the broader question of the metropolis' water supply, would be considered together in Committee. The London Water (Meter) Bill was designed to prevent 'an increase of the water rates of the Metropolis by reason merely of the increase of the annual or rateable value that may be unconnected with water supply and which may involve no commensurate increase in the consumption of water' (Mr Causton, Member for Southwark West, HC 1891, vol 351 col 191). The proposals contained within the London Water (Meter) Bill once again resulted in the relationship between metering and fairness, as well as biopolitics and economics, being fiercely debated.

For instance, Mr Webster, Member for St Pancras East, told the House that he was concerned about the high cost of metering systems, in terms of equipment cost and labour time, as well as the impact higher prices for water would have on low income households should these costs be passed on through bills. He stated:

It seems to me that the measure [of metering] is one entirely in favour of the rich and of the wealthy tradesmen of London, and very detrimental to the interests of the working classes. In Berlin the system of measuring and charging for water by meter has been adopted, and it has been found necessary to employ an Inspector for every 400 meters. Therefore, if the system is adopted in London it will be necessary to appoint no fewer than 1,600 Inspectors. The Bill, moreover, while it compels the companies to go to the expense of £3,000,000 sterling in securing meters, provides no means by which to raise the money... Further, the Bill may necessitate landlords in London putting in their leases the amount of water to be used by their tenants. In short, it is of such a complicated and confiscating character that I am surprised to find any of my friends on this side of the House supporting the Bill. I protest against its proceeding further (HC 1891, vol 351, col 196-197).

Mr Theodore Fry, Member for Darlington, spoke most emphatically about the issue, is worth quoting at length because his statement captures concerns about the cost, disproportionate financial impact on the poor and health implications associated with metering:

The Bill is eminently one in favour of the rich as against the poor. What will be really the effect of a measure of this kind? Many of the wealthy houses in London are shut up for several months in the year, during which time little or no water is used in them; and if a system of payment by meter is adopted, the charge upon the owners of such houses as these will be comparatively small. A rich man, who is an hon. Member of this House, today told me that he had refused to be put on the Committee to consider this question [of metering], because the result of such a Bill as this would be to put so much money in his pocket, that he felt that he could not fairly support it. This fact alone shows how much the Bill is in the interest of the rich. If the Water Companies lose money by the meter system in consequence of the closing of the houses of the wealthy during a certain season of the year, they will be obliged, in order to secure their income and pay their dividend, to make a heavier charge on the masses of the community and the poor. There can be no doubt that if water is charged by meter the price will have to be very much larger than is paid at the present time, and there will be a constant endeavour to limit its use in order to escape charge. For instance, in No. 44 meter district, Cornwall Road, Brixton Hill, the water rate is now on the average £1 3s. 9d. per house per annum, but if the charge is by meter system at the rate of 1s. per 1,000 gallons, the rate will be increased to about £2 16s. 2d. per annum. In these circumstances, the water rate will be enormously increased on the poor if the companies are allowed to charge by meter. Further than that, the Bill would tend to limit the use of water for sanitary purposes, and thus endanger the public health. The Bill, therefore, is a very mischievous one. The cost of the meters, again, will have to be borne by the consumers, and this is not an unimportant consideration. The principle also of the supply of water by meter is an entirely new one. Before I conclude, I will remind the House that an important official connected with the Local Government Board—Mr. Stoneham—gave evidence before a Select Committee on this point, and in answer to a question said that if water was supplied to London by meter it would certainly lead to a curtailment of the power of cleansing the houses of the poor, which is not very efficiently exercised under present circumstances; that under a meter system insufficient water would be used for sanitary purposes, which would lead to an increase of disease; and that the sewers would become stagnant, resulting probably in an outbreak of

cholera. Under these circumstances, I hope the House will not hesitate to reject the measure (HC 1891, vol 351 col 198).

The Bill did continue to Committee stage, but it did not make the statute books. Here it is important to note the strength of conviction that some Members expressed concerned regarding the perceived incompatibility of metering and a fair water charging system. Understandings of fairness, and the relationship between equity and the water meter, were contested and juxtaposed in a binary fashion. Some closely aligned 'fairness' with property rights, and, consequently, paying for water by volume. Whereas others considered equity, defined very broadly in biopolitical terms as access to sufficient volume of water for domestic purposes to tackle dirt at a price that all within society could afford, to be virtually incompatible with household metering. At this point metering set into motion a conflict between biopolitics and economics, in terms of paying for water by volume, which would reoccur over the next 120 years.

During the latter stages of the 19th century there were also more nuanced arguments being articulated about metering fairness. Biopolitics and economics were not presented as being diametrically opposed. For instance Siemens (1856) and Kent (1892) argued in favour of metering but proposed that any metering system should be structured so that low income households would receive enough water to service 'minimum' sanitary needs. Siemens emphasised that the 'principal value of meters to water companies consists in the prevention of waste' (1856: 117). He argued that metering presented three advantages:

1. Each customer only pays for the water actually used by him, whereas at present has to pay a share of all the waste that is going on.

2. Regulating the distribution of water on his own premises and for preventing waste by servants. This would obviate the inconvenience of water inspector visits.

3. The general prevention of waste will enable water companies to reduce charges (p.118).

However, he also noted that objections had been raised against metering ‘on the grounds that the poorer housekeepers would economise water with detriment to their own sanitary condition and also that the cost of the meter is too high in proportion to the amount of rent they pay’ (1856: 117). Here, Siemens suggested that ‘those objections are applicable however only to the case of labourers’ cottages’, who, he argued could be ‘supplied without restriction, or might be charged a fixed rate till their consumption exceeds a certain maximum' (ibid). Similarly, almost fifty years later, Walter Kent proposed that metering systems should include a ‘low minimum’ of water, as it ‘tends to assist sanitation and secure the remuneration of the supplier without causing any loss or hardship to the consumer’. Kent also proposed a ‘sliding scale’ of charges where households would pay the same amount per unit of water used in excess of the 'sanitary minimum’ but would pay different amounts per unit water used within the ‘sanitary minimum’ (1892: 101). In this context, Kent considered the ‘sanitary minimum’ to be 10 gallons per head; he argued that this would cover the cost of the mandatory flushing systems which were necessary to cleanse the sewers.

Kent argued that this type of metered water supply system would incentivise water economy yet retain ‘the sort of “legalised state socialism” involved in the rating system which ‘cheapens water to the poorer classes at the expense of the well to do, and which its advocates aver is its merit' (Kent, 1892: 122). This would address biopolitical concerns of securing the water supply and health of the population whilst incorporating a different type of economics than was practiced at the time. Here economics and biopolitics were not conflictual complementary; under this scenario, economics would become a key way of addressing biopolitical concerns. These proposals for differential metering tariffs resemble later block or step tariff designs and the Free Basic Water Policy in South Africa. Here, households are provided with a small amount of water for free , or at a reduced rate, and then are charged, through a block tariff, for the volume of water used in addition to the basic rate (Loftus, 2006; Muller, 2008). This is interesting because it shows an understanding of fairness and equity, negotiated and facilitated through metering, beyond the binary pronunciations popular at the time.

Despite the existence of such proposals, overall, parliamentarians appeared to be convinced that a constant, uninterrupted supply, devoid of any potential barriers to access created through price, was necessary to ensure the health of the city. The deliberate decision was taken to continue with water charging on the basis of a property based tax along with its

associated cross-subsidies. Importantly, decisions made in parliament indicate that the relative absence of household metering in England at this time, and in the contemporary moment compared to other European states, was not historical accident but a conscious decision made in defence of the nation's reputation as the 'home of hygiene', concerns regarding fairness and the protection of water providers' coffers. The decision not to advance metering solutions was in fact of core part of the state strategy for governing water and water users. What was less clear was what 'domestic' household water use actually referred to. It is to this issue the chapter now turns.

4.5 Delineating materialities of home through water metering

Objections to a metered supply for domestic use were founded on the notion that a sufficient supply of water should be available for all at an affordable price for public health reasons. It is important to note that this was not the same as advocating unchecked and unrestricted supplies of water. Instead household meters were adopted, in part, to demarcate the contested boundaries of domestic and non-domestic supply. Here meters played a positively political role in helping to shape understandings of basic water need as opposed to luxury, and profligate as opposed to necessary use. Water suppliers were statutorily obliged to provide water for 'domestic' use on an unmeasured basis yet were able to charge by meter for any services considered to be an 'extra'. Water meters were used to effectively compartmentalise consumption into separate water use categories and to help determine the perceived legitimacy of different consumption practices. Moreover, the meter contributed to consolidating contemporary understandings of normal and abnormal water use.[18] From this perspective it is clear, contrary to Joyce's assertion that technical solutions are depoliticising, 'that sanitation had become a matter of science and technology, separate from the political', meters were a cause of controversy and an important tool for mediating new understandings of fair, legitimate water use in and around the home (2003: 69).

'Extras' not considered as constituting 'domestic supply' included water closets, bathtubs, refrigerators, hosepipes and sprinklers. 'Domestic supply' therefore was largely limited to cooking and drinking water. Here the meter effectively drew a line between internal and

[18] The very same techniques continue to be used to today. Meters have been used to differentiate between water use inside and outside the home and to distinguish between 'necessary' and 'discretionary water use'. For instance since 1990 water companies have been able to meter homes that have a swimming pool, a sprinkler system or other water intensive devices such as power showers. Clearly, these divisions are socially produced, yet the meter has been repeatedly used to express those socially determined delineations.

external water use, hardened the division been ‘essential’ and ‘discretionary’ water use and between socialised ideas of ‘needs’ and ‘wants’. Water supplied for extra purposes was charged for by meter. In instances where a property could not be metered, a blanket fee was imposed in addition to the regular tariff. So although ideas surrounding the need for constant supply were prevalent at this time, these needs were not considered to be unconditional. The notion of discretionary water use suggests luxury, which in turn implies ‘waste’, or at least non-essential water use. Authorities were committed to ensuring that the cost of ‘waste’ of this kind was recouped. For instance the engineer for Kent Waterworks stated that

In the case of meters, we supply the meters because then we do not care how much they waste, as they have to pay for it (Morris, 1868: 497).

Metering represented an accumulation strategy for ‘non-essential’ extras, whereas charges for ‘essential’ water use continued to be levied on the basis of property value. The boundaries between essential and non-essential use were contested. For instance Taylor and Trentmann cite Mayor of Sheffield, Edward Tozer, who had stated in relation to baths that ‘if it was not a domestic use for a man to wash his skin and keep himself clean, he did not know what was’ (2011:21). Moreover, legal challenges were issued in response to the decision to legislate bathing as a non-domestic water practice some. For example Charles Bingham, who took his case to the High Court, believed that he should not have to pay additional charges for bathing and, wishing to avoid a meter, he had

Painted a waterline to mark the point where the bath held exactly thirty-two gallons. Opposite the tub hung above the line, and to mark each use on the calendar. Added up, the numbers would show how much water had “actually been used” over the year. Bath water was charged at 1s ½ d per thousand gallons…. Without his personal measurement Bingham believed he had been over-charged (Trentmann and Taylor 2011:21).

Bingham lost his case and was instructed to have a meter installed (ibid). While Bingham’s circumstances were privileged, access to indoor bathrooms and showers or even household piped supply was by no means universal and class politics certainly shaped the contours of access, his case shows how the everyday activities and understandings of domestic use became politicised throughout the period. Understandings of domestic water use were

contested, renegotiated and often expressed through metering (chapter six revisits this process in relation to compulsory metering).

What counted as domestic water use varied across the country and changed over time. For example, baths were considered to be ‘domestic’ by the 1930s and, as a result, associated charges were included in the water rate rather than as an extra. Engineers remained convinced that it was ‘of the greatest importance that water supplied by local authorities shall not be wasted and that no apparatus fitted up will cause either waste or undue consumption of water’ (Water Engineer’s Handbook, 1929). However understandings of what constituted water needs had shifted and baths had come to represent one of the material emblems of citizenship. Reflecting on the parameters of domestic water use, an entry made in the Water Engineer's Handbook (1930) stated that

An effort has been made to define domestic supply, and it is stated to be a sufficient supply to any dwelling house for ordinary use, including baths of a capacity not exceeding the prescribed number of gallons, and water closets, but shall not include a supply of water for any other purposes (Water Engineer’s Handbook 1930: 210).

Similarly, a year later, the Water Engineer’s Handbook reported the findings of a House of Commons Select Committee on Unopposed Bills which had:

Enunciated a principle with regard to the charges of water for baths. The committee has for some taken the view that there should be no handicap on the installation of baths. The committee will not accept any proposal again that is going to make a charge for the first bath. No obstacle of any kind should be placed in way of having a bath placed in every house in the country. The very fact that there was a separate charge for a bath was going to act detrimentally (Water Engineer’s Handbook, 1931).

Even though baths were included in the domestic rate, there were other uses that remained outside this spectrum and, in cases where a meter could not be installed, a fee described in the Water Engineer's Handbook as an 'arbitrary “all in” charge’ was made (see Table 7).

Table 7 Special purpose charges for water (Source: Water Engineers' Handbook, 1930: 210-211)

Consumption Activity	Price (per annum)	Consumption Activity	Price (per annum)
Aerated Water Manufacturers	£4 10s	Herb beer manufacturers	plus 50 per cent of domestic charge
Agricultural shows	£1	Horses	5s each
Allotments up to 400sq.	6d.	Horse trough or standpipe	£1 10s
Auction Marts for fat stock	£4 10s	Hose pipes	15s
Bacon washing	£2 2s	Hydrants	£1 10s
Bakehouses	7s 6d	Ice cream vendors	plus 50 per cent of domestic charge
Basket makers	from 20s	Laundries	£1
Beerhouses	per quarter of domestic rate	Lodging houses	10s in addition to domestic rate
Beer-raising machines	20s	Milk coolers	£1 10s
Billiard rooms	6d per £ valuation of rooms	Milk sellers, for washing utensils	18s
Bowling Green	by meter	Motor cars	7s 6d
Burial grounds	5s per tap	Offices	half domestic rate
Butchers	15s	Organs driven by water	£1 10s
Camping ground, circus, shows etc	1d per person or house & Steam engines and lorries 6d per day.	Oyster and shell fish shops	from 10s
Caravans	2s, 3d per quarter	Petrol Wagons	£1 10s
Caretakers	12d, 9d per quarter	Photographers	15s
Carpenters, joiners and cabinet makers' shops	per bench 4s	Pigs	5s
Cattle troughs in fields	10s each	Plasterers yards	from 5s 6d per half year
Chapels and churches	5s	Printing offices	1s 8d per half year
Chemists	7s 6d	Public houses	15s
Clubs, pubs	quarter domestic rate	Refrigerators	£1 4s (private dwelling)
Coachbuilders	15s	Sausage Makers	plus 50 per cent of domestic charge
Coffee carts	£4	Sheep dipping	£2
Concreting	1 1/2d per cu.yard	Shops (lock up)	half domestic

			rate
Conservatories	1d per sq.yard of site per half year	Slaughterhouses	£1 10s
Cows	6s each	Smiths	7s 6d
Cricket pitch	£2 10s	Soda Fountains	plus 50 per cent of domestic charge
Dairies	15s	Sprinkler Lawn	£2 2s
Dentists	7s 6d	Steam Cranes	15s
Donkeys	12s	Stonemasons	7s 6d
Eating houses	plus half of domestic rate	Sugar Boilers	from 20s
Fire Sprinklers	£1 per hundred heads	Surgeries	£1
Fishmongers	15s	Temperance hotels	plus hald the domestic rate
Fish washing	from 10s	Tennis court	£2 10s
Fountains, drinking	10s each	Tripe Sellers	plus 50 per cent of domestic charge
Fried Fish shops	15s	Vans, living	£2 8s
Greengrocers	plus half of domestic plus 10 per cent of domestic rate	Washerwomen	from 2s 3d per half year
Greenhouses	1d per sq. yard of site per half year	Wheelwrights per man employed	11s per half year
Hairdressers	7s 6d	Wine and spirit shops	from 5s 6d per half year
Hearses	£1 each	Workpeople in mils, factories etc for washing and drinking only	1 1/2 per head per quarter

The shifting understandings of essential and non-essential use reflect evolving ideas surrounding cleanliness and what Trentmann and Taylor refer to as 'perceptions of entitlement', water 'requirements' or needs (2011: 213). It is, however, important to note that although baths were increasingly considered to be legitimate domestic assets, this did not mean that access was universal; distribution was unsurprisingly determined in large by income. In this context, Orwell's comments on unequal access to water and changing perceptions of cleanliness in his pamphlet *The Road to Wigan Pier* are indicative:

Do the 'lower classes' smell? Of course, as a whole, they are dirtier than the upper classes. They are bound to be, considering the circumstances in which they live, for even at this late date less than half the houses in England have bathrooms. Besides, the habit of washing

yourself all over every day is a very recent one in Europe, and the working classes are generally more conservative than the Bourgeoisie. But the English are growing visibly cleaner, and we may hope that in a hundred years they will be almost as clean as the Japanese (1937: 121).

In this context it is clear that notions of essential and discretionary use are socially constituted; there is no objective, accepted measure of basic consumption or needs. Indeed, what constitutes essential use continued to be debated in relation to metering. For instance, in the 1980s Herrington argued that 'the emotional idea that virtually all domestic water use is essential to private and public health cannot be sustained in serious argument' and understandings of 'essential' domestic water use prevented any serious consideration of metering. More recently, Gleick recommended that 'international organisations, national and local governments and water providers adopt a basic water requirement standard for human needs of 50 litres per person per day (l/p/d) and guarantee access to it independently of an individual's economic, social or political status' (1998: 83). However, even then, Gleick recognised that water needs, according to climate and culture would differ. Elsewhere, South Africa, through its Free Basic Water (FBW) policy, concluded that, as a minimum, households should be able to access at least 6 kilolitres of water per day.[19] In England and Wales interviews with policy makers undertaken as part of this thesis confirmed that there is no accepted standard of consumption to benchmark against. Interviewees also noted that any attempt to develop a basic standard of consumption would be politically charged and shaped by dominant power relations. One consumer group interviewee argued that it would not be in the public interest for there to be a basic level of consumption because privatised water companies would, cynically, seek to produce a narrow measure for basic consumption. This section has shown how the meter has been important in helping to delineate and negotiate boundaries between domestic, essential and discretionary use. In turn, the meter helped determine what counted as legitimate water use or profligate uses of water.

4.6 Conclusion

This chapter provides the first part of a genealogy of water metering that is vital for contextualising and better understanding the emergence of compulsory water metering in

[19] The FBW policy differs across municipalities, for instance eThekwini has increased the volume of FBW each household is provided with from 6 to 9 kl/h/d (Nash 2012). For more detail about the emergence and politics of FBW see Loftus (2006) and Muller (2008).

South East England. This chapter demonstrates that the water meter has been a key fulcrum around which the waterscape has been renegotiated. In this context, uses of the meter have not been static; the water meter, as a contingent technology, has been used in different ways to express competing understandings of fairness and domestic water use. This chapter explored how the meter was used in three particular ways: as a way of regulating and securing constant supply, as a way of limiting price increases and as a way of delineating the boundaries between profligate and essential use.

Importantly, the meter was used to target different objects of government and, in turn, to reflect different and changing understandings of fairness. Meters were used to monitor the water network in an effort to secure constant supply and, in turn, maintain high standards of public health. Meters were in operation on a district level rather than a household level and monitored the network rather than household water practices. Water charges were based on property value and so contained an element of cross-subsidisation. For some, this system was perceived to be unfair and measured bills were called for; volumetric bills were positioned as a way to avoid annual price increases imposed by the water companies. The object of the meter changed, meters were deployed to measure household water use rather than water lost through the network. This debate highlighted contested understandings of fairness and, to an extent, a conflict between liberal economics and the biopolitical needs surrounding access to water Fairness was constructed as either ensuring that the needs of the poor were met through an unmeasured charge to prevent a potential public health threat, or charging by volume so that household water charges more closely reflected water usage despite the poor potentially paying considerably more than under the unmeasured system. The chapter also demonstrated that what was understood as domestic water use changed over time; the meter was used to demarcate this divide. In this context, the meter played a vital, politically charged role in negotiating the waterscape. These debates are important because they give context to similar discussions concerning the fairness of contemporary compulsory metering programmes; chapter six explores the contemporary relationship between metering and fairness. In this sense, metering effectively set into motion a conflict between economics and biopolitics that would be regularly revisited for over a century. The following chapter builds on this genealogy of water metering and contributes to better understanding how and why contemporary compulsory water metering programmes emerged in 2010.

5 Negotiating the waterscape, from a supply fix to securing life: A genealogy of water metering (1960 – 2009)

5.1 Introduction

This chapter forms the second part of the genealogy of water metering and covers the period between 1960 and 2009; it provides context to the emergence of contemporary compulsory companywide metering programmes in the South East of England. Overall, the chapter argues that the meter has been used to tackle a variety of biopolitical governance problems and has targeted different objects of government. By examining the different roles that the meter has been deployed to perform, this chapter shows that the meter is a contingent technology which cannot be divorced from the political and economic circumstances that surround it. This chapter, read in conjunction with chapter four, constructs a genealogy of water metering that is vital for understanding how contemporary water metering programmes emerged, from the perspective of some water companies and policy makers, as a desirable way of governing water and water users.

The chapter begins by examining the pivotal role that engineers played in water planning and the relative reluctance to pursue metering in the 1950s and 1960s. The first section builds on Herrington's notion of the 'supply fix' and examines the preference for supply side solutions over demand side options. The following section explores the growing influence of economists, at the expense of engineers, between the mid-1960s to mid-1970s. The chapter then considers the consequences of the growing influence of economics and the water metering experiments undertaken throughout the late 1980s and early 1990s. Subsequently, the chapter examines how, following privatisation, the meter was used to discipline water use. This section takes the example of the Lower Grange Campaign for Water Justice to demonstrate how meters, and the type of waterscape that they represented, were resisted. The chapter then turns to more draconian expressions of water metering during the 1990s where prepayment meters with a disconnection function were used primarily as a means to discipline payment rather than water use. Subsequently, the chapter explores how, following the defeat of prepayment meters in the courts, metering on a compulsory basis emerged as an option to secure water supplies in water stressed areas. The meter evolved from a way of disciplining water use or price to a means of securing life in the water stressed South East of

England. Importantly, movement between different uses of the meter was not smooth or linear; this chapter draws out how struggles over different expressions of metering helped negotiate how water and water users were governed. In this context, Foucault's governmentality framework helps to demonstrate how debates over metering have, to an extent, set in motion a conflict between particular understandings of economics and biopolitics. The privileging of market principles through metering has often been interpreted as antithetical to the biopolitical security of the population. Nonetheless, from the 1980s, the meter was increasingly positioned by some water companies and stakeholders in the sector as a vital instrument for securing the waterscape.

5.2 Meeting demand without measuring consumption: the 'supply fix'

This section examines the pivotal role engineers played in water planning and the absence of a sustained commitment to household metering until the 1960s (Herrington, 2007). The 1950s and 1960s were best described, according to Twort, as 'an era of giganticism' (1963: 9 in Hassan, 1998). Policy makers were concerned with safeguarding a sufficient quantity of water for industrial supply rather than monitoring domestic water use. In this context, Hassan claims that the 1950s and 1960s witnessed 'unprecedented growth in the demand for water and, therefore, accelerated development of the nation's water resources' (Hassan, 1998:61). Notably the construction of reservoirs grew 'exponentially during post war recovery' (McCulloch, 2009: 463). Herrington described the main techniques for managing water as a 'supply fix', due to the focus on constructing new sources of supply, and argued that this period was characterised by a dereliction of economics in favour of engineering expertise (1974; 1982; 1993). Although significant water supply shortfalls were experienced, authorities did not perceive them to be an important problem. For example a Joint Committee on Water Resources considered the significance of the 1933-34 drought to be 'somewhat exaggerated in the minds of the public' (Hassan, 1998:34). It was not until the establishment of the 1955 Central Advisory Water Committee (CAWC) that serious thought was given to future growth in demand for water (Jordan et al, 1997). The CAWC was tasked with 'preparing a balance sheet of supply and demand for water' (CAWC, 1959). Although supply options continued to be favoured, the CAWC 1962 *Report of the Sub Committee on The Growing Demand of Water* briefly considered metering. It argued that metering was 'the ideal solution', yet concluded that metering was not practical because the cost of metering

outweighed the cost of water supply (CAWC, 1962). During this period metering was not investigated in great detail.

Towards the end of the 1950s, following drought in 1959, and amid growing fears regarding the loss of farmland to reservoir construction, policy makers increasingly looked to engineers to inform decisions about the planning of controversial reservoirs. The assumed neutrality of engineers enabled this group of key experts to exert influence in policy making spheres (Maloney and Richardson, 1994). In this sense the formation of the Water Resources Board (WRB) in the mid-1960s, the self-proclaimed 'master planner of the water resources of England', was fundamentally important (WRB, 1965). The core functions of the WRB were to collect data on national water demand and to advise ministers 'on the development and use of water resources throughout England and Wales' (McCulloch, 2009: 461). The WRB also undertook its own research and provided technical expertise to the water authorities. Here the WRB was primarily concerned with 'the issue of water quantity' (Jordan et al, 1977: 320). Shortly after its inception, the WRB commenced a number of studies on 'the future demand for water in different regions', it concluded that 'demand for water would double by the end of the century' (Jordan et al, 1977: 320). These engineers, according to Herrington, relied on 'unsophisticated extrapolation' methods up until the 1990s. This involved 'placing a ruler through a time-series with roughly the right slope and then drawing forward' into the future, for Herrington the WRB's forecasting methods relied 'on large doses of intuition and foresight' rather than evidence based planning (1979: 7).

The access the WRB had to central government made it an extremely important body despite its lack of formal decision making powers (McCulloch, 2009). Although its role was advisory, the WRB had significant influence on the way that water problems were framed. The WRB favoured large scale engineering projects over demand side options like metering. Kinnersley went as far to say that 'what the Water Resources Board really offered [was] not a future strategy but an engineering spree – just like the old days, but even bigger' (1988: 90). Here the WRB's approach shaped dominant approaches to managing water. According to Ward, the WRB's priorities reflected

Not the financial priority of reducing costs, nor the ecological priority of conserving the more vulnerable sources, but the engineering priority of, as a matter of pride, meeting demand at all costs (1997:7).

Kinnersley, came to a similar conclusion arguing that

Clearly this contributed nothing to helping a modern prosperous community learn to share water better or act with more respect for its water environment. The crude aim was to make the natural regimes of small river basins adapt more to human purposes however self-indulgent they might be (1988: 90).

In this context, Herrington described the dominance of 'well-tried engineering principles' as 'an intellectual straitjacket, inhibiting the industry from responding sensibly to changing economic, financial and environmental circumstances' (1982: 28).

Much of the criticism levelled at the WRB emanated from a group of relatively high profile economists, including Herrington, who were seeking to encourage the water sector to take economics more seriously. Such was Herrington's prominence, the Chairman of Seven Trent Water Authority described him as 'the high priest of the water demand school of thought' when introducing him to the Royal Society of Arts (Herrington, 1982). These economists, who were concerned with the 'sane' allocation of water, were highly critical of organisations like the WRB and argued forcefully for greater emphasis to be placed on the economics of water supply (ibid). Referring to the WRB's reluctance to turn to demand management strategies such as household metering, Herrington argued that the WRB's claim that they had carried out 'considerable research' on metering was a 'complete fabrication' (1982:30). Instead he argued that a 'dogmatic', 'anti-metering' attitude haunted the organisation which, he contended, was inappropriate for the modern water supply network (Herrington, 1974).

Amidst pressure from academics and economists to pursue metering, members of the WRB argued that metering had come to represent a 'King Charles' Head issue for many people in the water supply industry'. Meaning, from the perspective of the WRB members, that metering had become an irrelevant obsession that intermittently resurfaced in relation to debates about water supply management (Calvert, WRB 1967). Policy makers' decisions were informed by the perceived need to increase supply to meet what were (erroneously) assumed to be ever increasing industrial demands. The water supply system reflected ideas of fairness where water was perceived as a social service that should be paid for through forms of taxation. Between the 1960s and 1990s the supply fix approach was dislodged as a result

of the rising standing of demand side economics.[20] Consequently, the relative benefits of metering became an important political issue for policy makers. This in turn prompted reflection on how fairness was understood in the sector. Again, as in the previous chapter, debates over metering provoked conflicts between particular understandings of economics and biopolitics. Support for metering, and for the market economics associated with metering, was often predicated on 'whether you saw water as a social service or a commodity' (Memorandum MHLG, 1967).

5.3 Water meters: why not? The decline of the 'supply fix'

From the mid-1960s a discernible shift within the sector was set into motion. Economists began to take an increasingly important role in influencing policy, which marked the decline of what Herrington had coined the 'supply fix'. This was not a clean, linear transition but one that was hotly contested behind the scenes. This section examines the struggles over metering and explores how the meter was used to express different understandings of water and fairness. The chapter focuses on intra and inter-ministerial discussions, the personal campaigns of a small number of civil servants, the role of academics specialising in economics and an attempt by George Kent Meters to establish a domestic market for metering. The decline of the supply fix is an important moment in the genealogy of water metering because this contributes to the emergence of contemporary compulsory water metering programmes. At this point, liberal forms of economics were increasingly understood as being complementary to efforts to secure the waterscape. Indeed developing an approach to governing water and water users that was informed by economics was deemed to be necessary in some circles (see chapter two on market environmentalism). While the relationship between metering, economics and biopolitics had been consistently struggled over since the introduction of the Deacon Waste Water meter (see chapter four), at this time a new governmentality was emerging that favoured ways to govern water that were inspired by demand side economics. This particular form of economic thinking was increasingly positioned as the major form of knowledge and apparatus of security that would secure the

[20] While demand side options became more prominent, preference for supply driven solutions did not completely disappear from the political lexicon. John Redwood MP, among other posts former Minister for Local Government and Inner Cities (1992), Secretary of State for Wales (1993-1995), Shadow Secretary of State for the Environment, Transport and the Regions (1999-2000), made an argument at an All Party Parliamentary Water Group meeting in 2012 which elevated supply solutions above demand side options. When discussing drought resilience measures, Redwood made an analogy between Bakeries and Water Companies. He argued that just as Bakers avoid disappointing customers by producing additional bread rolls to match supply, water companies ought to deliver sufficient water to match customer demand rather than focus on reducing household demand for water.

waterscape in terms of environmental and financial sustainability. Here the metering, in its various forms, became a key focal point in the waterscape for thinking through how water and fairness were understood.

In 1966 Kent Meters (see chapter four for more on this company) wrote to William Howie, the Member of Parliament for Luton, where the company was based, to compel Howie to lobby government to 'see whether or not the metering of domestic [water] supplies could be encouraged in this country' (Howie, 1966). Howie obliged, bringing the issue to Jim McColl's attention, who was the Parliamentary Secretary to the Minister of Housing and Local Government (MHLG) at that time. Howie noted that

Needless to say, Kent make water meters and do very well in the exports with them…. they argue of course that a stronger home market for their meters would greatly help their prospects.

When writing to Howie, Kent Meters had enclosed a persuasively written pamphlet based on Bird and Jackson's 1965 paper *Water meters: why not?* The pamphlet set out the economic case for metering and argued that:

Metering can help reduce this wastage without any reduction in domestic use. The greater part of the waste usually occurs on the customer's side of the meter. The customer is charged for this and is thus given an incentive to avoid leaving taps running or overflows operating unnecessarily, and to report any leakage he notices on his premises. Meter readings help to detect leaks not noticed by the customer. They also remind us that water has a cost.

Kent informed Howie that 'our next step should be to promote interest amongst water suppliers'. Kent Meters circulated the pamphlet and claimed that at least 24 water providers had registered an interest in exploring metering in further detail.

Although politicians were not convinced by the economic argument for metering, Rayner, from the MLHG, was taken by the idea of water metering and in June 1967 wrote to the WRB, in confidence, to seek advice about the feasibility of metering. Not even the water authorities were to be consulted, the Ministry evidently did not want to draw any publicity to

the matter. Metering was considered a hazardous political issue; Ministers on both sides of the house have often been reluctant to pen their names to a commitment on water metering.

After corresponding with the WRB, civil servants within the department produced a relatively detailed briefing note called '*Water Charges – supplies for domestic purposes: Note on metering vs water rates*'. The authors of the briefing note, Cliver and Street, tried to weigh up the different arguments for and against metering in terms of preventing waste, inducing the customer to use less water and the problem of punitive charges which might disproportionately impact poorer households, particular those with 'dirty jobs'[21] (1967: 10). The briefing note questioned whether it might be more fruitful to devote attention towards waste detection rather than broach the subject of waste indirectly through universal metering. Of 'fairness' in relation to metering, the authors noted that the concept was problematic and unconvincing. They stated that if metering were to be considered as a viable policy option, ideas surrounding fairness could be utilised as 'a useful make-weight argument, [however], the main justification would… probably have to be the saving of water' (1967: 10). The treatment of the issue of fairness as a make-weight argument is particularly interesting considering that 'fairness' would, in 2010, be cited by some companies as one of the primary motives for introducing compulsory metering (see chapter five).

With this in mind, civil servants sought ministerial approval in October 1967 to undertake 'experiments in the metering of water supplies to domestic consumers, in consultation with the water industry and with academics in the appropriate disciplines (economics!), with a view to change legislation to enable the experiments to be made'.[22] They also requested permission to approach the Treasury for funds to support the proposed metering experiments. Civil servants were convinced that the cost of supplying water on an unmeasured basis was increasing 'so fast that the Department [would be] duty bound to explore the subject'. Despite expectations that metering would be 'ill-received by the public', it was thought that 'it may be necessary' to further explore metering (Girling, 9th October 1967). Subsequently, Lord Kennet, Parliamentary Secretary of the MHLG, suggested three courses of action

[21] Such jobs included but were not limited to mining, heaving industry, agricultural work.
[22] The 1945 Water Act had only permitted metering for non-domestic purposes, therefore a change in the law would be needed to allow for metering trials for domestic purposes.

(1) To have a committee to advise us on (2) how to set up an experiment which could (3) tell us whether general domestic metering was a practical possibility (16th October 1967).

Kennet suggested that 'we could expect much unpopularity at (3): a little at (2): but hardly any at (1) (Kennet, 16th October 1967). Subsequently, the minister responded to Cliver and Street, asking if setting up such a committee was urgent and enquiring as to whether their claim that metering could result in demand savings the region of 10 per cent in the South East by 2001 was accurate. The minister also sought confirmation as to whether the 'idea of "saving water"' was the main consideration behind the proposal. The minister was anxious about negative publicity and argued that any 'announcement – or the leaking out from the British Waterworks Association of news of the committee – could give rise to stories that the government were looking into "rationing" water, and rationing it by price'. He noted that while Lord Kennet agreeing to a subcommittee did not commit the government to metering, he also stated that the establishment of a committee is 'hardly likely to be regarded as purely academic'. Concerned that the minister's ambivalent response would result in the metering experiments stalling, the aforementioned civil servants went to great lengths to strengthen their proposal. For instance, the MHLG wrote to its German counterpart to find out more about how metering worked in Germany.[23] Hoping to persuade the Labour minister that metering did not necessarily have to pose a threat to the poorest in society. They even fleetingly researched which 'Communist' countries had metering programmes, reporting that

I have heard that water is metered in Poland, but not on reliable authority. It might help in convincing the Minister if we could say that even in a Communist country metering has not been thoroughly anti-social. It is not worth making special enquires, but if you or Mr Rayner happen to know whether any of the countries that meter are Communist ones, it would be worth mentioning the point (7th Nov 1967).

Street replied noting that parts of Russia are metered, as was much of Poland and Czechoslovakia. Moreover Chilvers suggested that Yugoslavia pursued a domestic water metering policy. Unsurprisingly the minister was utterly unconvinced. Stating that 'I am still un-persuaded by this persuasive minute. I think NOT' (17th November 1967: emphasis in the original). In particular the minister was concerned because water suppliers were sceptical

[23] Metering is widespread in Germany. It is commonplace for households are to be metered, although not all apartments are metered.

about metering and he expected that the measure would be deeply unpopular with the public. After hearing news of the minister's decision, Calvert of the WRB informed Rayner that he was 'disappointed'. He asked whether there was any chance the issue would be reopened, suggesting that Herrington's charge that the WRB showed 'unreasonable hostility to domestic metering' is somewhat severe. Rayner considered that it would be 'highly improbable' that the minister would reconsider metering. However, still keen to pursue the issue, he discovered an opportunity to undertake a metering 'experiment' without the publicity risk but on a much smaller scale than originally anticipated. The opportunity arose when Malvern water authority was to become amalgamated into South Worcestershire (both Malvern and South Worcestershire were supplied by Seven Trent Water).

Malvern was granted special dispensation for metering in 1891 (although the reason for this was unclear), this made Malvern an anomaly within the water charging system. It was the only area in the country to have been metered on an almost universal basis for a considerable period of time. The level of metering in Malvern enabled research into how households use water. This is why Herrington has described Malvern as the 'Mecca for Economists'. According to Herrington, 'it is likely that more intimate detail is now known about the personal sanitary habits of the long suffering and water economising citizens of Malvern than of any other group in the English-speaking world' (1979:4). The amalgamation of Malvern and South Worcester represented as interesting opportunity because it would allow the consumption patterns of households who had been metered for a long period of time to be compared to those that had not. Rayner hoped that the trial would finally end debate over the viability and desirability of water metering. According to Rayner, 'the benefits of [an experiment] would be confined to ending (one would hope) a long and inconclusive wrangle; if the results themselves were inconclusive, the expenditure would of course have been wasted; but if the results showed that metering produces economies, the experiment could result in very substantial savings' (November 11th 1969). Rayner hoped to end the debate one way or another.

Interpretation of results from the series of metering experiments undertaken in Malvern, as well as Flyde, in the 1970s, were not universally agreed upon. For instance Herrington noted that interpretation 'remains difficult and controversial'. Nonetheless the dominant interpretation of the results suggested that PCC domestic consumption was approximately 10 per cent less in metered than non-metered areas (Herrington, 1979). Results from initial

experiments were described as 'both improbable and inconsistent' but the 'more careful work' undertaken as part of the government-Severn Trent experiment was held in higher esteem (ibid). Slowly, the notion that metering could potentially help reduce water demand started to take hold in the sector. Economics was beginning to be taken more seriously in the sector and demand management was becoming a more prominent concern.

The change in government in 1970, from Labour to Conservative, resulted in ministers that were more open to the possibility of metering taking office as well as some legislative changes which set the foundations for further meter experiments. This did not mean that metering was a fait accompli for the Conservative Party. The issue remained controversial and was intermittently debated within the House of Commons. The primary concern was the extent to which a metered system represented the introduction of commercial charging for an essential need and the health and social implications might result from this metering . The opposition accused the government of seeking to introduce metering on a near universal basis; a claim that the Undersecretary for the Environment, Mr Eldon Griffiths, dismissed as 'moonshine' in 1972. Nonetheless, the 1973 Water Resources Act Granted Regional Water Authorities powers to install meters and to use them for charging purposes.

In this instance the customer was expected to cover the costs of metering installation and, as a result, meter penetration remained very low. The reorganisation of the water sector in 1974, where the multiple water suppliers were consolidated into 10 Regional Water Authorities and the WRB was disbanded, were also important changes. Any notion of central planning was lost and the decisions over metering trials and experiments were delegated to the respective companies. Although for a short time after the WRB was disbanded there had been some consensus regarding the relative benefits of metering, the Conservative government demonstrated greater appetite to explore water metering. For example the 'Water Use Studies Group', an 'informal meeting of like minds from the water authorities, driven by Vic Cocker and the Severn Trent Water Authority', initiated further metering trials at Malvern and Mansfield between 1974-79 (WDM: 2). The Water Use Studies Group met under the auspices of the newly created National Water Council[24] and published *Paying for Water* which raised the issue of selective metering in 1976. Within this context, the Council for the

[24] National Water Council was the successor to the WRB, it consisted of a chairman nominated by the minister as well as the chairman of each regional water authority and no more than 10 additional members nominated by government; the organisation has been described as 'weak and ineffective' by McCulloch (2009:471).

Protection of Rural England reasoned that a 'quiet revolution' was occurring within this sector (1977). This was perhaps confirmed in 1977 when the Secretary of State refused Southern Water's application for a reservoir at Broad Oak, suggesting that the company should consider demand strategies more seriously (Herrington, 1979).

This section has shown how the influence of engineers was slowly supplanted by that of economists. In turn, meanings of fairness became increasingly contested. The economists in question viewed resistance to metering as 'dogmatic' and 'emotional' and argued forcefully, unsurprisingly, for economic thinking to take precedence. In part this meant advocating for, and experimenting with, metering (Herrington, 1979). However, it is notable that this movement from engineering to economics was far from smooth; the resulting debate over metering in this period was reminiscent of previous debates regarding the fairness of metering. The type of market economics represented by the meter were presented as both in conflict with and complementary to the biopolitical security of the waterscape. Market economics were interpreted as both a potential threat to and guarantor of public health through regulating access to affordable supplies of water.

5.4 Creeping compulsory metering?

The Secretary of State for the Environment has intervened four times, and he has protested too much. We do not believe him when he says that he is not in favour of compulsory water metering. Why? Because, before the Tories were elected, they did not say that they would privatise rain, but when they got into power they did (Dennis Skinner, 1996 HC vol 281, col 188).

The 1990s, in the context of a newly privatised water sector, was a turbulent time for debates over metering in England and Wales. The Conservative party had issued legislation that prohibited the use of rateable charges beyond the year 2000 in an attempt to accelerate the emergence of a metered charging system.[25] It was during this period when the regulator, for the first time, made absolutely clear its preference for metering in two papers: *Paying for*

[25] It quickly became clear that establishing a metered charging base would not be possible within the given time frame. The 1999 Water Industry Act reversed this decision, again allowing Rateable Values to be used as a means for structuring water charges.

Water (1991) and *Paying for Growth* (1993). Here the regulator played a key role in pushing companies towards metering solutions. Sandwiched between these two reports, the government also expressed preference for metering in *Using Water Wisely* (1992). In this context, some, rather polemically, claimed that water meters were 'the government's last great hope to create a market in water' (Counterclaim, 1995) while others joked that the *Paying for Water* paper appeared to be a 'manifesto for the Compulsory Metering Party' (Labour Party Brighton Fringe Meeting, PUAF). Rather than being perceived to be a marginal issue, metering was presented as the optimum, most rational, way of ordering the water charging system. At this point metering, as a technology of government that promoted self-regulation and market inspired patterns of resource allocation, was increasingly positioned by government and the economic regulator as a vital way of securing the waterscape.

The government instigated a series of metering trials to establish the feasibility of a metering system (WDM, 2010: 6). Interestingly, these were primarily designed to test the financial viability of metering, rather than the impact these types of schemes might have on PCC. The National Metering Trials took place over twelve areas of the UK (see Table 8) between April 1989 and March 1993 and were led by David Gladbury of Southern Water. The final report claimed that the introduction of metering resulted in average household water use reductions of 21 per cent. Other analysts concluded that 'the average reduction in domestic consumption associated with compulsory metering was found to be 11 per cent nationally' and 'suggested that compulsory metering had very marked effects on peak demand with a 30 per cent reduction being recorded in peak month, week, day and hour demand in years with hot, dry summers (Ofwat, 1992: 22; Goyal and Hall, 1992). In a sense, metering was beginning to be positioned as an engineering fix that would result in reductions in household water consumption.

The much contested results from these trials have gained enormous traction within the water sector. In particular the claim that water metering can help reduce average PCC by c.10 per cent has been uncritically reiterated so frequently, although source of the 10 per cent figure is rarely referenced directly, that it has taken on an almost mythical quality. The continued use of the National Water Metering Trials results are problematic for two reasons. Firstly, consumer groups argued that the trial results should be treated with caution because the sample was not representative of population as a whole and the study did not take into

consideration the potential burden that the poorest might face. Secondly, the results have been presented in a crude fashion in that they failed to distinguish between demand reduction from heightened leakage detection and changes in customer water use.

The composition of the National Water Meter Trials were heavily criticised by consumer organisations because the demographics of the trial area differed dramatically from the population at large. For example, a small percentage of those taking part in the trial received benefits or were on low incomes. Questions were raised about the potential hardship metering could cause to low income households who might try to cut their consumption significantly (Hugby, 1994). Interviews with the trial's participants revealed that 'the great majority stated that they did not regard it [reducing their water use] as necessary... [and] that they could afford to pay for the amount of water they were using at present' (National Metering Trials Working Group, 1989). However, a small but significant number of households taking part in the trial suffered financial hardship and some cut back on what consumer organisations considered to be essential use. Here Hugby argued that 'a distinction ought to be made between cutting back on essential use to avoid financial hardship and debt and extra use to minimise waste' (Hugby, 1994). When discussing these issues at a Public Utilities Access Forum (Forum) sub group meeting on 21st July 1997, PUAF concluded that 'there is no real proof that metering affects consumption' and asserted that the National Water Metering Trials were defective and narrow' (ibid). The PUAF noted:

Data emerging from the national metering trials are not representative and the final report gives only rudimentary information about the effects on demand. Although metering overall appears to have resulted in reduced levels of consumption this is by no means the case in all households, or even in all sites (Sub Group Meeting, 21st July 1997).

It is common for water companies to state that customers who have meters tend to use, on average, about 10 per cent less water than those who do not. Importantly reiterations of the 10 per cent statistic do not make a distinction between water demand reductions and leakage control. Here the notion that households *use* 10 per cent less water seems somewhat undermined. Furthermore, the notion of average water customer and average water use hides the diversity in water use practices and the varied impact metering could have on different social groups (see Pullinger et al, 2013 for recent work on the diversity of water use).

Table 8 National Water Meter Trial Areas

Trial Area	Number of Properties	Participating Company
Isle of Wight	48 000	Southern Water
Bromsgrove (Worcs)	1191	East Worcestershire Waterworks Company
Camberley (Surrey)	1174	Mid Southern Water
Brookman Park (Herts)	1145	Three Valley's Water Service
Hotwells (Bristol)	1007	Bristol Water
South Nomanton (Wakfield)	815	Yorkshire Water
Chorleywood (Herts)	813	Three Valley's Water Service
Hutton Rudby (Teeside)	997	Northumbrian Water
Haling Park (Croydon)	756	Thames Water
Chandlers Ford (Hants)	595	Southern Water
Broadstone (Poole)	358	Wessex Water
Turlin Moor (Poole	320	Wessex Water
Total	53332	

With this in mind it is perhaps surprising that the 10 per cent figure continues to be used as part of the evidence base used to justify contemporary company-wide compulsory metering programmes. Interviewees maintained that there is an 'overwhelming collective thinking' within the water sector 'that you get a 10 per cent reduction' through metering yet interviewees also acknowledged the imprecise nature of the 10 per cent statistic:

*Recent evidence isn't all that forthcoming. There is quite a bit of evidence comes from the Isle of Wight trials in the 1980s and there have been some UKWIR research more recently but none of them are completely conclusive on the demand effects of metering. But if you take the body of evidence on the whole, there's a suggestion that there's a 10% reduction. It's not by any stretch of the imagination science' (**water company interview conducted on 15.09.2011**).*

This data is often supplemented with data from households who have opted for a meter. This is problematic because households who opt for meters tend to benefit from being charged by volume (for example smaller households) and thus do not tend to give further insight into the impact metering might have on low income families who reside in low rateable value properties (Ofwat, 2012).

Although the foundations of the oft cited 10 per cent figure has its foundations in the trials undertaken during the early 1990s, it continues to influence the way metering is presented to households, even if the source of the 10 per cent finding is rarely cited.[26] Instead it is attributed to 'independent research' or merely 'research' thus masking the age of the data source. Here the meter, in the 1990s, was beginning to be understood as an engineering fix that would lead to reductions in overall measures of household consumption.

Following trials in the early 1990s, metering technologies were utilised in various forms throughout the 1990s: traditional 'dumb' volumetric meters were used in new builds whereas prepayment meters and flow restrictor valves tended to be targeted at households in debt to the water company. Importantly, meters were used for the first time as a means of directly disciplining payment and water consumption as a whole rather than just external use or 'non-essential' use. Prepayment meters and trickle flow valves played a particularly important, but highly controversial, role in facilitating different ideas about the waterscape.

In this context, PUAF argued that the 'government had decided that water was a product, not a service' (21st Feb 1995). Increasingly water metering, as a technology of government, was perceived to be a fair, economically rational, conservation tool. Although policy makers and regulators appeared keen to establish a metered charging system, some water companies were rather less enthusiastic about the prospect of metering. For example while Anglian Water committed to a proactive metering campaign, in part because Anglian operate in a water stressed area and was under pressure from the National Rivers Authority to take measures to conserve water before it built more reservoirs, most other companies, including both Thames Water and Southern Water, ruled out similar programmes citing expense as the major barrier.

[26] More recently research published by the Energy Savings Trust (EST), where participants were drawn from people who had used the EST online water calculator, suggested that the households with meters could use just 3% less water than non-metered households (EST, 2013).

5.5 The government's 'Secret Agenda'?

The government line is a paraphrase of Henry Ford: "You can have any system you like, so long as it's metering" (Dobson, 1996 HC vol 281, cc 184-237)

Lord Deben (John Gummer), who held the position of Secretary of State for the Environment in the 1990s, suggested that 'no one was particularly focused on metering' (**interview conducted on 03.06.2013**). However, according to the opposition, as well as consumer organisations, the government was seeking to realise a compulsory metering system. National press led with articles claiming that the government had a 'secret agenda' for water metering (Guardian, 1995). Arguments surrounding metering intensified throughout the 1990s due, in part, to the radically rising cost of water bills and the high rate of disconnections for non-payment (see Table 9). Metering was debated furiously within Parliament in 1995/6 which is perhaps unsurprising given that the 1997 election was fast approaching. Raising the profile of water, as an important and immediate issue, presented a political opportunity for the Labour Party.

Table 9 Domestic disconnections for non-payment (1989-1998) (Source: Bakker, 2004: 132)

	89-90	90-91	91-92	92-93	93-94	94-95	95-96	96-97*	97-98
Water Service co.	5747	5417	13234	11141	6916	5115	3169	1833	1205
Water Supply co.	2679	2456	8048	7495	5536	4932	2657	1315	702
Total	8426	7873	21282	18636	12452	1047	5826	3148	1907

*Household disconnection for non-payment prohibited from 1997.

In this context, the Labour Party used its Opposition Day[27] to launch a verbal assault on what they saw as a thinly veiled commitment to compulsory metering and a reluctance to consider alternative, non-metered, ways of ordering the water system. The then Shadow Environment

[27] Opposition Days are days that are allocated to the official Opposition in the House of Commons in each session for discussion of subjects chosen by the Opposition. In total 20 days are allocated for this purpose per session.

Secretary Frank Dobson led a vehement attack on the government's water metering policy on the grounds of 'social justice'. Lord Deben argued that Labour's approach was organised around 'old class war battles' where Dobson focused on two arguments: that metering would be a tax on the poor and that water companies were not doing enough to deal with leakage (**interview conducted on 03.06.2013**). Dobson opened his speech by asking the house to call

Upon her Majesty's government to abandon its hidden agenda to force water metering on every household, which would prove expensive, unjust, dangerous to health and the least cost-effective way of protecting the environment (Dobson, 1996, HC vol 281, cc 184-237).

Here Dobson described metering (and the forms of economics that underpinned metering) as a threat to public and environmental health. Again economics and biopolitics were placed in opposition. The Labour Party was convinced that the Conservative Party, particularly John Gummer, was concealing a 'hidden agenda' concerning metering, despite the government making no explicit statement to this effect. Dobson argued that the government's approach, facilitated by the newly established independent regulator, amounted to 'creeping compulsory metering'. He stated that

The Tory government want to force every family in the land to install water meters. They will not put that proposal in their manifesto for the general election, but it is on their secret agenda. The water regulator the government appointed is even worse. He is obsessed with promoting water metering for domestic customers. He seldom misses an opportunity to push water metering (Dobson 1996 HC vol 281 cc 184-237).

Lord Deben confirmed that the government saw water metering as being the most appropriate means of structuring the water charging system and stated that those who opposed metering were effectively climate change deniers. He has subsequently called into question Labour's competency on environmental issues; Lord Deben recently alleged that Frank Dobson 'wouldn't understand an environmental problem if you threw it at him' and suggested that 'the Labour Party in those days had no environmental policy' (**interview conducted on 03.06.2013**). In contrast for Lord Deben water metering presented a means of better balancing environmental objectives by prompting people to reduce their water consumption through financial incentives. Market economics and metering were not in conflict with biopolitics, rather they were complementary. This, he claimed, was a 'common sense'

approach (HC 1996 vol 281 col 184). Lord Deben did, however, refute Dobson's claim that the Conservative party favoured *compulsory* metering, he stated that:

The hon. Gentleman has made an allegation which is entirely untrue. The government do not wish to force people to have water meters. We are opposed to compulsory water metering. The government have no intention of introducing it (Lord Deben, 1996 HC vol 281, cc 184-237).

Gummer preferred optant metering, where households could choose to receive a metered charge, citing Anglian Water's approach as a model for others to emulate. Anglian had installed meters in homes within their constituency but did not initially use them to structure water bills. Instead, customers were provided with comparisons of their unmeasured and prospective measured charges and were then asked whether they would like to revert to a metered charge on a permanent basis.

The main thrust of Dobson's critique was levelled at the government's failure to consider alternative ways of charging for water. He argued that the Conservative Party was thus placing a disproportionate responsibility on households to save water. He argued that

Everyone accepts the need to save water, to restrain the growth in demand and to make sure that our use of water is environmentally sustainable, but that does not mean that everyone should be forced to have a water meter. There are other ways of saving water and reducing demand. We believe that the alternatives to water metering would give better value for money, would have a quicker impact, would be more equitable, and would be less of a threat to public health (Dobson, 1996 HC vol 281, col 237).

Dobson was not alone in his interpretation of the situation, Save the Children (Herbert and Hempson 1995; Cunningham, et al 1996), the Consumers' Association (1996), some of the regional Water Voice committees, PUAF and AgeUK were amongst the many consumer organisations who voiced concern about the government's water policy at this time.

Dobson's shadow department produced a number of reports in 1995/6 including Licensed to Leak: How the Tories Let the Water Companies of the Hook (1995), More Money Down the Drain: Water Leakages and Water Profits (1996a), The Waterfacts of Privatisation: Failure,

Waste and Greed in the Privatised Water Industry 1990-5 (1996b), Ending the Waste: Labour's Plans for a World Class, Water-efficient, Sustainable Water Industry (1996c) Floods of Cash, Floods of Excuses: Labour's 1996 Annual Report on the Privatised Water industry (1996d). These papers exposed the scale of company leakage and highlighted the gross profits which the sector had accrued while customers struggled with escalating water prices. Here Dobson pledged to: establish and enforce tough mandatory leakage targets; require water companies to offer a free leakage repair programme for customers; require water companies to carry out free water efficiency audits of people's homes; promote the development and use of water-efficient devices in the home; ensure new buildings are designed to promote efficient use of water; refuse licenses for increased abstraction; require companies to compensate customers for interruptions in normal supplies; instil tougher fines for pollution by water companies; publish a national audit and require water companies to publish their annual performance in local newspapers. Here Dobson advocated a different way of governing the waterscape and argued that rather than placing responsibility on customers through metering, and encouraging forms of self-government, companies should be compelled to tackle leakage. While important in illuminating the contested understandings of the role of the water meter and its relationship to fairness, the Labour Party's analysis was rather blunt and established crass dichotomies between metering and better leakage control.

Alongside these strong views for and against metering, a more nuanced debate was emerging within the water sector about the future of the water charging system at this time. The work of NPI/OXERA, which culminated in the 1999 report *Water Charging and Social Justice: Why politicians must act*, was of particular note (Palmer, 1999). Overall, this document argued that both the existing unmeasured tariff, based on rateable value, and blanket metered tariffs were socially and environmentally regressive. One of the reasons why this volume is so interesting is that it contains an article by Keith Harris, the then Director of Finance and Regulation at Wessex Water. He called for variable tariff structures in order to provide a service responsive to both social and environmental imperatives. With respect to metering, Harris was especially critical of blanket volumetric tariffs. He argued that

Currently every customer, rich or poor, faces the same metered price. Not surprisingly therefore the cost of metered water is more regressive than in the unmeasured sector. Furthermore, it is low income households who have the greatest incentive to save, as their water bills are a greater share of their total household budget. This is exactly the wrong

message. There is little if any need or purpose in restricting the use of customers who, on the whole, do not impose peak demands. Indeed, given the limited amount of discretionary use in low income households, any reduction in demand is likely to come in the form of essential use and instances of what is fashionably known as social exclusion (Harris, 1999: 33).

Similarly, Martin Fitch, of Sheffield City Council, argued that metered water bills will 'always result in disproportionate impacts on the poor'. Fitch favoured water charges based on Council Tax bills because, 'like housing refuse collection and other council services, water and sewerage provision constitutes an essential service' (Fitch and Price, 2002). As an alternative to a blanket metered tariff, Harris recommended using a combination of rising block tariffs (where the cost of water per unit rises in correlation with the volume of water used) and Council Tax bands to determine water charges. He hoped that this system would achieve two goals: (1) provide incentives for high volume water users to economise on their water use and (2) be more sensitive to household affordability. Here Harris exposed the multiple ways in which metering technologies (inclusive of the tariff) can renegotiate the water charging system; metering does not inherently produce regressive water charging systems.

Harris', as well as others', work on the potential use of Council Tax bands within the water charging system received criticism. Firstly, it was highly questionable whether, in practical terms, it would be desirable to use Council Tax bands as a basis for water charging. Critics argued that Council Tax bands had become divorced from income. As an article in Counterpoint noted:

The problem for those who want council tax bands to replace water rates is that council tax bands are not very closely aligned with ability to pay. Anyone who is going to introduce a fairer system will first have to look at reforming the council tax system itself (Counterpoint, 1995).

Counterpoint argued that it would be altogether more radical to 'accept that the whole community has an interest in ensuring that everyone is connected to the water and sewerage system' and, 'on this basis, water should be treated as a "public good", funded out of general taxation' (Counterclaim, 1995). These approaches, which transcended the binary arguments for and against metering, barely made an impact on the broader water sector or on the

parliamentary based debates at the time. Instead, discussions about metering were increasingly juxtaposed with leakage rates, as a conflict between economics and biopolitics.

Discussions about alternative tariffs demonstrate that the meter is a contingent technology and can result in multiple water charging systems. During the 1990s it became clear that metering was perceived as the ideal strategy. Although the Conservative Party was accused of having a secret agenda regarding metering, policy at this time was far removed from universal, compulsory metering. Rather than enacting a universal metering system, meters were instead employed as disciplinary tools targeted at those on low incomes. The following sections focuses on the experiences of residents of the Lower Grange Estate and the debates that materialized during a local government led legislative campaign against prepayment metering and trickle flow valves. It shows how the meter was used as a disciplinary tool to govern waters users' interactions with water. Whereas in the previous chapter the meter was perceived to be a means to governing the network or a sense of justice for some households, the subsequent section examines some more negative instances of metering, where metering was deployed as a technology of the self, and explores how understandings of a fair waterscape were struggled over through metering in this period. In this context conflicts between market economics and biopolitics took precedence.

5.6 Disciplining water use? The Lower Grange Campaign for Water Justice

Water companies had been able to install meters in new homes since 1990. The move to install meters in every new home differed from previous expressions of metering: the water meter was no longer used to mediate or delineate between different types of water use in the home. Instead the meter was used to measure usage as a whole, and the distinction between essential and discretionary use dissolved somewhat over this period. The emergence of Lower Grange Campaign for Water Justice is illustrative of some of the struggles over water and water metering throughout this period; especially regarding the way water meters could be used to discipline water use and, in Foucauldian terms, as a technology of the self.

The Lower Grange Campaign for Water Justice was comprised of residents from the Lower Grange Council Estate in Bradford, Yorkshire which included 850 semi-detached houses

built in the 1920s. In 1991, residents were moved into new properties following complaints that their existing homes had significant problems including rising damp and a lack of indoor toilets (Hyatt, 2004: 2). These new properties were fitted with water meters. In just a matter of months a group of tenants had formed the Campaign for Water Justice. For many within this group, the water meter was considered to be a potential threat to water for 'basic' needs.

Importantly no one from the housing estate was disconnected for non-payment. However the organisation argued that households frequently rationed their water use below acceptable levels and personal debt had spiralled as a result of meter installation (Hyatt 2004: 5). Households were self-regulating their water use in ways which were considered a threat to the biopolitical health of the population. Residents made comparisons to their neighbours, who had not been metered, and found that their bills were larger. Leaders of the organisation argued that residents could not maintain 'hygiene standards' and newspapers reported an unconfirmed link between water metering and a surge of cases of dysentery in the area. In this sense, water meters, as a technology of the self, had been used to successfully, and arguably draconically, discipline water use. As a result the organisation called for the discontinuation of water metering. The standpoints (as well as the creativity) of the residents are in part captured in the poem below (Figure 8) written by a member of the organisation, signed 'The Tortoise, which discusses water quality, access and cost.

Figure 8 "The Water Meter" written by the Tortoise (member of the Lower Grange for Water Justice Campaign) (Source: PUAF, 1993)

Dear Sir, some words to say I'orter,
What's this 'ere about our water?
I'm sick to death on feeling dowdy,
Sometimes Dull and sometimes Cloudy.
Now it's time to go to town,
Oh No! The water's turning BROWN.

There's lots of people 'goody-goody',
I wonder if their water's muddy.
Our homes would look so much neater
When they've sorted out our Water Meter.
We're crying over milk that's split,
It's too late now the homes are built.
Every Rose, June or Kath,
Would like their folks to have a bath.
With a family's imperfection,
There's a fear of mass infection.

Friends and family we are greeting
When we go to our public meeting.
We all sit down and then discuss
Sorting things out, what's all the fuss?
Then someone, who has got some power
Says, "Why bother, why don't you shower?"

This is not a plot that's sinister,
This is a plea to our Prime Minister
We'd like to know what is the fate
Of folks who live on our Estate.

This poem's been written in a rush
It costs too much to 'toilet flush'!
What happens when there's a drought?
They threaten to bring the standpipes out!
And what about disabled folk?
They can't carry theirs, it's no joke!!

The Lower Grange Campaign for Water Justice also organised public protests: two particular forms of protest stand out and are worth briefly expanding upon. The first involved members of the organisation donning Victorian dress and washing clothes in the city centre public

fountain, making the fountain bubble using soap. Members of the organisation argued that the Victorian attire reflected Yorkshire Water's approach to water supply. Their main aim was 'to demonstrate that the problems on Lower Grange were not matters confined to individual households but, rather, that they were emblematic of the way in which government had "washed its hands" … of the responsibility for acting to protect the public's health and welfare' (Hyatt, 2004: 2). The second involved members using a campaign fund to buy water company shares (which would have been approximately £8 at the time) so that they could attend meetings and air their grievances.

The majority of the organisation's efforts centred on the removal of water meters from the residents' homes, arguing that they were unjust. The Lower Grange Campaign for Water Justice's opposition to metering was not lost on Ofwat, in fact the regulator met with the organisation on 1993. At this meeting a spokesperson for the campaigners, Joe Flerin, presented their predicament to the General Director of Ofwat, Ian Byatt. The transcript is worth quoting at length because it reveals how ideas surrounding water need, equality and even democracy are presented differently in the exchange. Joe Flerin, of the more vocal members of the Lower Grange Campaign stated that

Our main reason for coming to talk to you this morning is to voice our anger and outrage at Yorkshire Water's treatment of Lower Grange residents with regards water meters… We believe that we have been denied our democratic rights to choose whether we have water meters installed. We live in a democratic society and we are angry that Yorkshire Water Authority has usurped that democratic right of ours. They have done so in installing water meters without prior consultation with the residents of the Lower Grange area. While the properties were being built, there should have been proper consultation with the representative of Lower Grange.

We demand justice… We demand the removal of the water meters in the homes of the residents of Lower Grange. We also demand that every resident who has had a water meter installed without prior consultation be approached individually and asked, and let them have the choice whether they have a water meter installed or whether they want meter rates in the normal, conventional way.

Flerin also suggested that metering could threaten existing cleanliness practices:

Let us just look at the situation between a mother and her son... A year, two years ago, the mother used to instil in that child, that boy, the importance of cleanliness, of hygiene, of tidiness. To have a bath every day, keeping clean, because cleanliness is next to godliness. Yet this same mother is having to turn round to that boy and say sorry, son, you can only have a bath once a week or once a fortnight. When you come in from playing outdoors, you have to be extremely careful how much water you use to wash your hands because we've got to save water. I can't afford to pay the exorbitant cost for water usage. Can you imagine what that son is going to say to his mother? That "mother, you've been trying to impress upon me for so long the importance of cleanliness, now you're turning round to me and saying I cannot use water" (PUAF, 1993).

In response, Ian Byatt attributed rising water costs to EU water quality standards, drew attention to the decision making procedures in the water sector and was rather dismissive about the groups' objections to metering. He stated the group had

... made a number of points about democracy and human rights, and those are important matters, but I've got to remember that I've got to act within the law and the law in the country which we live in is made by Parliament, and is how our democracy works, and that Parliament has decided that the rateable value system of charging for water will not be available to any company after the year 2000, and, of course, there are no rateable values assessed for new properties, and Parliament has given companies the right to devise the charging method, and that went through parliament and was subject to debate. Now you may or may not feel that that was right or wrong but that is the situation that Parliament has decided and those are the arrangements under which I operate (PUAF, 1993).

Byatt's response was not well received by residents. Maggie Chapman, one of the leading members of the group, questioned the mismatch between the metering policy and the design of the new build houses as well as the lack of means residents had to adapt their homes in order to mitigate against bill potential increases caused by meter installation. She asked

When our houses were built in 1991 why were they not fitted then with water saving fixtures and fittings? We have to throw gallons of water down the sink yearly as we wait for the hot water to begin to flow. We have gigantic sized baths and our toilets are completely

inadequate. Yet when we receive our bills, there is a pamphlet enclosed telling us how to use water wisely!! Put a brick in the toilet system! Get a shower installed! Buy an ecological washing machine!! WHERE ARE SUPPOSED TO GET THIS KIND OF MONEY FROM TO FOLLOW THIS ADVICE?? (PUAF, 1993 – emphasis in the original).

The Lower Grange Campaign for Water Justice, along with a number of other groups, drew national recognition for their work. The campaign exposed the deeply political characteristics of water supply and contested understandings of what the waterscape should look like as well as the key role the water meter has in advancing particular ideas surrounding fairness, disciplining water use and negotiating understandings of the waterscape. The campaigners argued that water meters placed greater pressure on households to reduce their water use. In this sense meters could be described as a means of disciplining household water use. The problem from the groups' perspective was that some of the households in question reduced their water consumption below socially acceptable levels and struggled to find ways of mitigating against bill increases. Metering in this context, as a technology of the self, represented a potential threat to public health.

5.7 Disciplining payment: the budget payment unit and trickle flow valves

Alongside legislating for the installation of water meters in new houses from 1990, this decade is also noteworthy for the introduction of prepayment water meters, sometimes referred to as 'Budget Payment Units', and flow restrictor valves. According to Drakeford, 'by June 1995, 11 companies were trialling or using units and a further 5 were planning trials' (1998: 592). These devices represented the more draconian potential of water metering. Four elements of this particular metering technology differed fundamentally from other expressions of metering: water charges were made up front; the meter predominantly measured time rather than volume of water used; the meters served a (self-) disconnection function; and the flow restrictor valve could reduce water supply to a trickle. So different were the characteristics, that PUAF member Ian Ford, who worked for local government, questioned 'when is a meter not a meter?' It is these functions which prompted PUAF members to emphasise that it was

Important to differentiate between volumetric meters which have concerned PUAF for a long time and pre-paid meters... Irritatingly, prepayment is as nicely contradictory a piece of

social welfare as might be imagined, a mixed blessing that sustains people at a minimal level by alternatively providing and denying supply (PUAF, 1993).

This statement refers to the positioning of prepayment water meters as budget management tools and a means of disciplining *payment* rather than water use. Companies argued that prepayment meters were an important part of ensuring 'disciplined payment behaviour and giving customer confidence that they can get on top of debt' (PUAF, 1997). In this context, Lord Deben has suggested that prepayment meters represented a legitimate option for water companies seeking to collect payment from customers who, he argued, could afford to pay their bills yet refused to.[28] Lord Deben argued that 'you have the kind of person that does not pay any bills, quite seriously, so there you have a real problem' (**interview conducted on 03.06.2013**). Typically, prepayment meters were targeted at customers who had fallen into arrears and companies argued that these meters would help ensure that households did not miss water payments. Customers were expected to liaise with the water company to purchase water for an agreed amount of time, measured by the meter, after which they could use as much water as they desired for that allotted period. Once this time period expired, and if the customer had not agreed a subsequent payment or topped up the meter, the water supply would cease or in some cases would continue at a trickle. At times of restricted flow, water would be sufficient for drinking water and perhaps, over time, toilet flushing. Yet the supply would be inadequate to meet the socially ascribed needs of most households. In this sense, the prepayment meter could be best understood as a means of disciplining payment.

The prepayment water meter's capacity to prevent households from accessing the water supply, particularly through self-disconnection, made the use of this technology a contentious political issue. For instance, PUAF (1993) made clear that their non-regulator members were 'fundamentally against budget payment units because customers can self-disconnect'. Although the rate of households being disconnected for non-payment by water companies had decreased by 19 per cent between 1993/4 and 1994/5 in England and Wales, Drakeford has drawn attention to the 'accelerating adoption of prepayment devices by companies in that same period' (1998: 592, also see Bakker 2004). The disconnection function of prepayment meters meant that the decision to disrupt the water supply was transferred from the water company to the household. Consequently, due to meters being deployed as technologies of

[28] Although some, for example Water UK (2009), have tried, differentiating between those who are supposedly unwilling to pay and who are unable to pay is extremely controversial and difficult.

the self, it became more difficult to track the number of households without a constant water supply. As Drakeford convincingly argues

The direct effect of prepayment meters has been to remove the public visibility and awareness of disconnection by companies themselves, and to 'privatise' that decision within the lives of the poorest houses (1998: 600).

The acceptability and suitability of prepayment water meters became a hotly contested issue. Influenced, in part, by the Merseyside Campaign for Water Justice and the Lower Grange Campaign for Water Justice, a number of Local Authorities in the North West of England 'sought legal advice on the implication of prepayment meters for local authority powers' in 1994 (Drakeford, 1998: 596). Subsequently, Robert Carnwath QC concluded that prepayment meters contravened the water provider's statutory domestic supply duty. Following this advice, Liverpool City Council wrote to Ofwat to request that prepayment meters be declared illegal.

Initially, Ofwat rejected the conclusions of the legal counsel and circulated a letter stating its support for prepayment meters. Ofwat stressed that the devices were adopted on a voluntary basis and argued that customers were 'exercising choice to go without water' (1998: 596). Similarly, North West Water argued that these devices effectively amounted to a 'pay as you go system' where the customers agree 'an amount they think they can afford and then pay that on a weekly or even daily basis' and, 'as long as the person pays the agreed amount, he can use as much water as he needs' (PUAF 1993). Consequently, in March 1996, six local authorities (Birmingham, Liverpool, Salford, Manchester, Oldham and Lancashire County Council) took joint legal action against the use of prepayment water meters with a disconnection function. These local authorities were supported (financially) by over 20 additional local authorities (Drakeford, 1998: 596).

The councils were granted a full judicial review in the autumn of 1996. Mr Justice Harrison found in favour of the local authorities and declared prepayment meters unlawful on the 20 February 1998 (ibid, 598). The government subsequently legislated to remove the power of water companies to disconnect customers for non-payment and prohibit prepayment water metering devices with a disconnection function and flow restrictor valves. This decision is important because it prioritised access to water over payment recovery in law. Here the

prepayment water meter was perceived to operate in a draconian fashion, posed a threat to the ability of domestic water users to access water. As Lord Deben noted, deploying prepayment water meters with a disconnection became 'politically impossible… because people believed that water is essential, people don't like the idea that people are being cut off, so it was felt to be contrary to human rights if it were to be cut off' (**interview conducted on 03.06.2013**).

Following the removal of powers to disconnect domestic household water customers, the desirability of prepayment meters and flow restrictor valves as tools to discipline payment continued to resurface periodically. Some actors questioned whether prepayment meters could be used to discipline payment in a less draconian manner. For example, the then consumer body, Water Voice, suggested that rather than disconnecting the water user, prepayment meters could 'emit a noise when more money was required in the meter to make further payments towards the water bill' to assist households in budgeting (Water Voice and Ofwat, 2003: 43). However, Water Voice warned that this proposition would 'not [be] well received by either customers or money advisers' (ibid). More recently, the Walker Review (2009) and Water UK (2009) explored the potential for using prepayment meters and reduced flow valves. The Walker Review team did not recommend the introduction of prepayment meters or reduced flow valves and determined that 'in today's society, other less draconian debt recovery methods should be employed' (Walker, 2009: 139). Nonetheless, some companies continue to express support for the use of these devices (ibid). In contrast, CCW, the CAB and UNISON oppose their introduction. UNISON went as far to warn that it would mount a legal challenge if these technologies were introduced. For the foreseeable future, prepayment meters of any type are unlikely to feature in England and Wales.

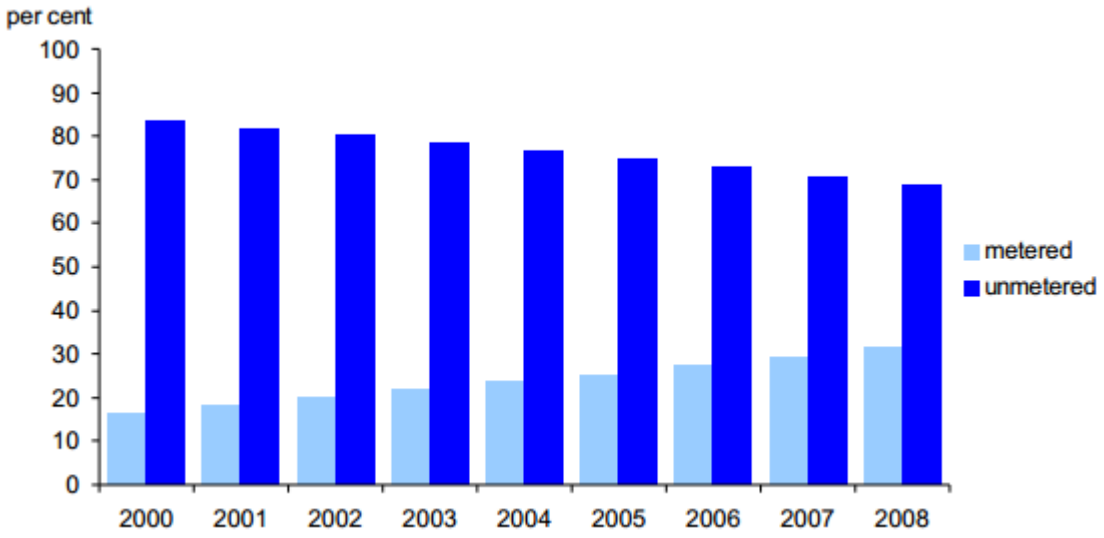
Debates over prepayment meters were significant because they involved a shift from disciplining water use to disciplining payment, and from predominantly measuring water to measuring time. These particular technologies of the self had different objects as the target of governance. While Coutard and Guy correctly highlight that prepayment technologies can, potentially, offer positive features such as budget management, during the 1990s, prepayment meters were used as a blunt disciplinary tool. Prepayment water meters helped negotiate a waterscape where low income households faced a risk of being disconnected from the water supply. The struggle over the desirability of prepayment meters reflected a struggle over what the waterscape should look like; whether payment should be prioritised over access to water. Metering again placed economics in opposition to biopolitics.

5.8 Securing Life: making compulsory water metering possible

After disastrous publicity over prepayment meters, other forms of metering were approached with caution in England and Wales. Metering was primarily advanced through the Free Meter Option scheme where households could request a meter at the expense of the water company. In addition to the Free Meter Option scheme, providers were also permitted to meter new homes and could exercise limited powers to compulsory meter households that were deemed to have high levels of discretional water use (e.g. possessing a swimming pool, sprinkler system or power shower). Typically, households who opted for meters tended to be those who would benefit financially from metering, e.g. small or single person households or households in parts of the country where unmeasured tariffs were especially high. As a result, metering has been carried out in a haphazard, unplanned fashion and the rate of metering penetration is highly uneven across the country. For instance, South West Water has a usually high rate of metering as a consequence of customers electing to take a meter in order to offset above average unmetered water charges caused by water quality investments that have been required by the EU.

The Free Meter Option scheme, in addition to the water companies' limited compulsory metering powers, resulted in metering rates rising steadily by around two per cent per annum from 2000 until the introduction of compulsory metering programmes in 2010 (EA, 2008, Figure 9). However, following a serious drought between 2004 and 2006, debates over the utility of water metering resurfaced and the meter was presented as a way of dealing with 'potential permanent "water scarcity"' in the South East of England (Taylor et al, 2009: 591). This section argues that following the prohibition of prepayment meters, household water metering was increasingly framed in turns of securing life by helping to guarantee future water supplies in water stressed areas. This did not mean that the all of the disciplinary aspects of metering disappeared completely. Rather, these were complemented by a change in focus. Metering was increasingly framed as a way of managing water stress rather than just disciplining payment. In this sense, to an extent, changes in the emphasis of metering debates has mirrored shifts in Foucault's analysis regarding his evolving his work on governmentality; the object of government has, to an extent, altered.

Figure 9 Percentage of households with meters in England and Wales (Source: EA, 2008)



Concerns about levels of water stress are not new, however the experience of drought between 2004 and 2006 in South East England revealed 'fundamental tensions' about water consumption, especially regarding what is normal or legitimate consumption, whether consumption should depend on ability to pay and whether there are inherent problems with existing arrangements for supply and demand for water (Taylor, et al, 2009: 591). While previous metering strategies have focused on disciplining payment, targeting the use of a small set of households, negotiating understanding fairness in relation to distributing the costs of water supply and measuring waste on a district basis, debates about metering in the immediate run up to the introduction of compulsory metering centred on how the meter could be used to manage the relationship between household water use and high levels of water stress in the South East of England. Importantly, water demand management had become a high profile issue and patterns of household water use have been increasingly scrutinised (Defra, 2012; ICE 2012:4; EST, 2013).

In this sense metering was understood as a tool for helping to secure future water supplies. With an average daily water usage of 145 litres per person (CCC, 2012: 11), many within the water sector have argued that domestic water users in England are profligate and take water for granted (Defra, 2011: 4, Ofwat, 2012; Fairness on Tap, 2011). Although the accuracy of comparisons is questionable due to data being measured in different ways, according to the EA (2008a) levels of household water consumption in England compare unfavourably with

PCC rates in other European states. For instance Austria has a PCC rate of 125 litres, Belgium 107 litres, Denmark 131 litres, Germany 115 litres, and the Netherlands 127.5 litres. Most within the water sector are united in arguing that water is "undervalued" and that there is scope to reduce household water consumption. For example, in 2008 the government announced an aspirational target of reducing PCC from c.150 litres per day to c.130 litres (Defra, 2008a).

In this context, a range of stakeholders have argued that increased levels of metering is the most effective way of tackling the risks posed by water stress. Metering is thought to enhance awareness about the value of water and instil a heightened sense of market discipline into pricing. In turn, water metering was presented as being a fairer way to structure the water charging system (Walker, 2009; Fairness on Tap, 2011; Doron, 2012; Ofwat 2011; EC 2012: 11). Here water meters, this time through compulsory programmes on a companywide scale, played a pivotal part in attempts to renegotiate the waterscape.

Following Defra's (2007a) *Consultation on Metering in Areas of Serious Water Stress,* the concurrent EA's (2007) publication *Consultation on Identifying Areas of Water Stress,* and a proposal from the Water Savings Group[29] (2005-2008), companywide compulsory metering projects were regarded by government and some water companies as a legitimate policy option. This marked a decisive change in attitudes towards metering. Meters were positioned as vital tools or, as Tibbett (2007) described, major weapons for managing water stress in South East England. Water companies argued that the 'low hanging fruit', the so-called easy options, for managing the supply/ demand nexus had been exhausted and, therefore, metering represented the next logical step towards securing water supplies (**water company interview conducted on 31.01.2011**). More expansively, one water company manager responsible for metering operations argued that

We have increasing demand in the South East because we have an increasing population and relatively high per capita consumption as well... So when you have a population that is growing and there is a gap that has been around for a while, you have to keep filling it. We have taken the low hanging fruit already, the cheap options have already gone in, so we are

[29] The Water Savings Group was established in 2005 and was tasked with developing ways to reduce water demand. The group met every six months and was comprised of Defra; Department for Business, Enterprise and Regulatory Reform, Ofwat, EA, Water Companies, CCW, Water UK and Waterwise (non-government organisation with a remit concerning water efficiency).

*in a world where metering is the next option on the list (**Water company interview conducted on 15.09.2011**)*

The EA's work on water stress was pivotal in legitimising and supporting compulsory water metering interventions. The EA, at Defra's request, developed a classification system to describe the levels of relative water stress across England; it designated areas as being subject to 'serious', 'moderate' or 'low' levels of water stress (Environment Agency, 2007: 2). The EA found that the South East faced serious levels of water stress, the Midlands and South West recorded moderate levels of water stress whereas the North of the country faced low levels of water stress (see Figure 10). The classifications have been recently updated (July 2013). Classifications are determined on a water company area level, however the new publications also include an assessment of water stress at a water body level, which was more nuanced than earlier representations (see Figure 11).

Figure 10 Areas of water stress (Source: EA, 2007)

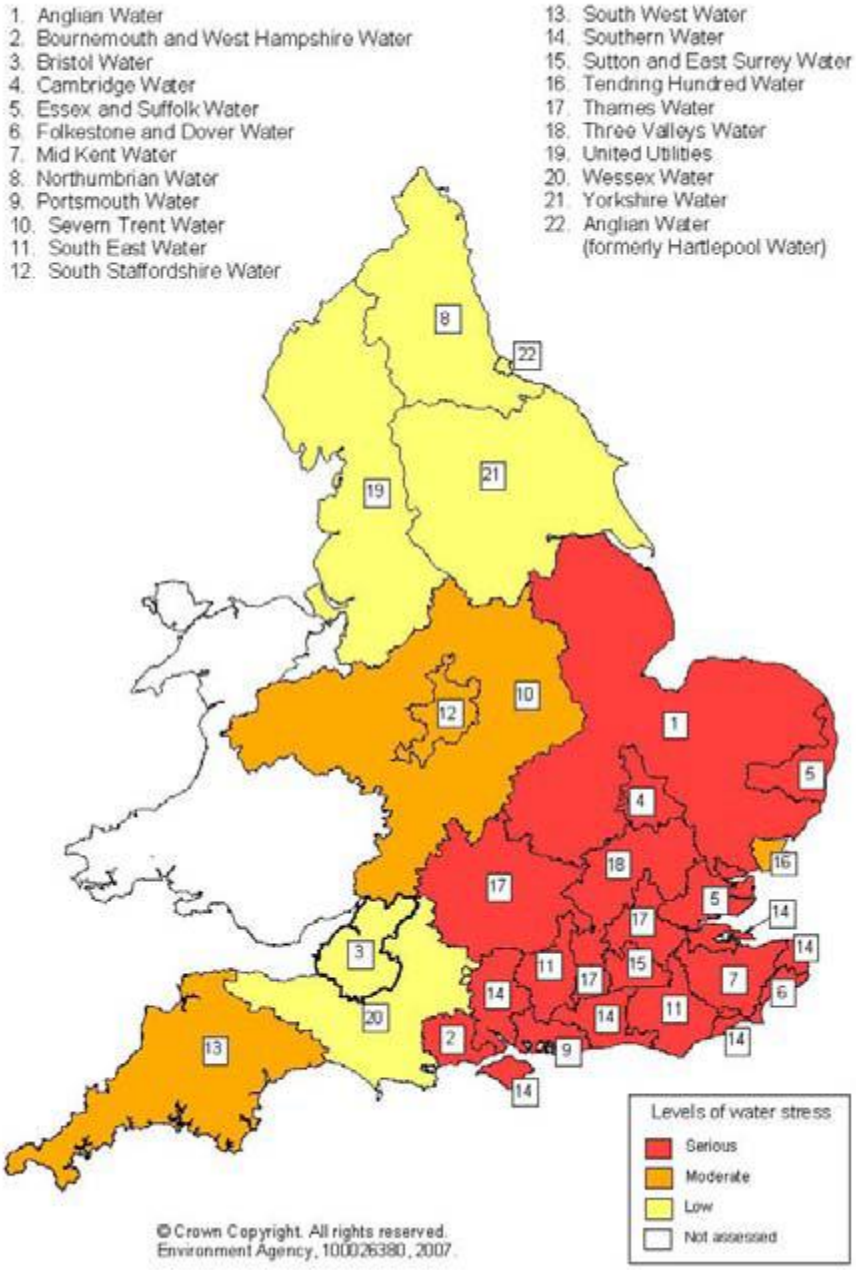
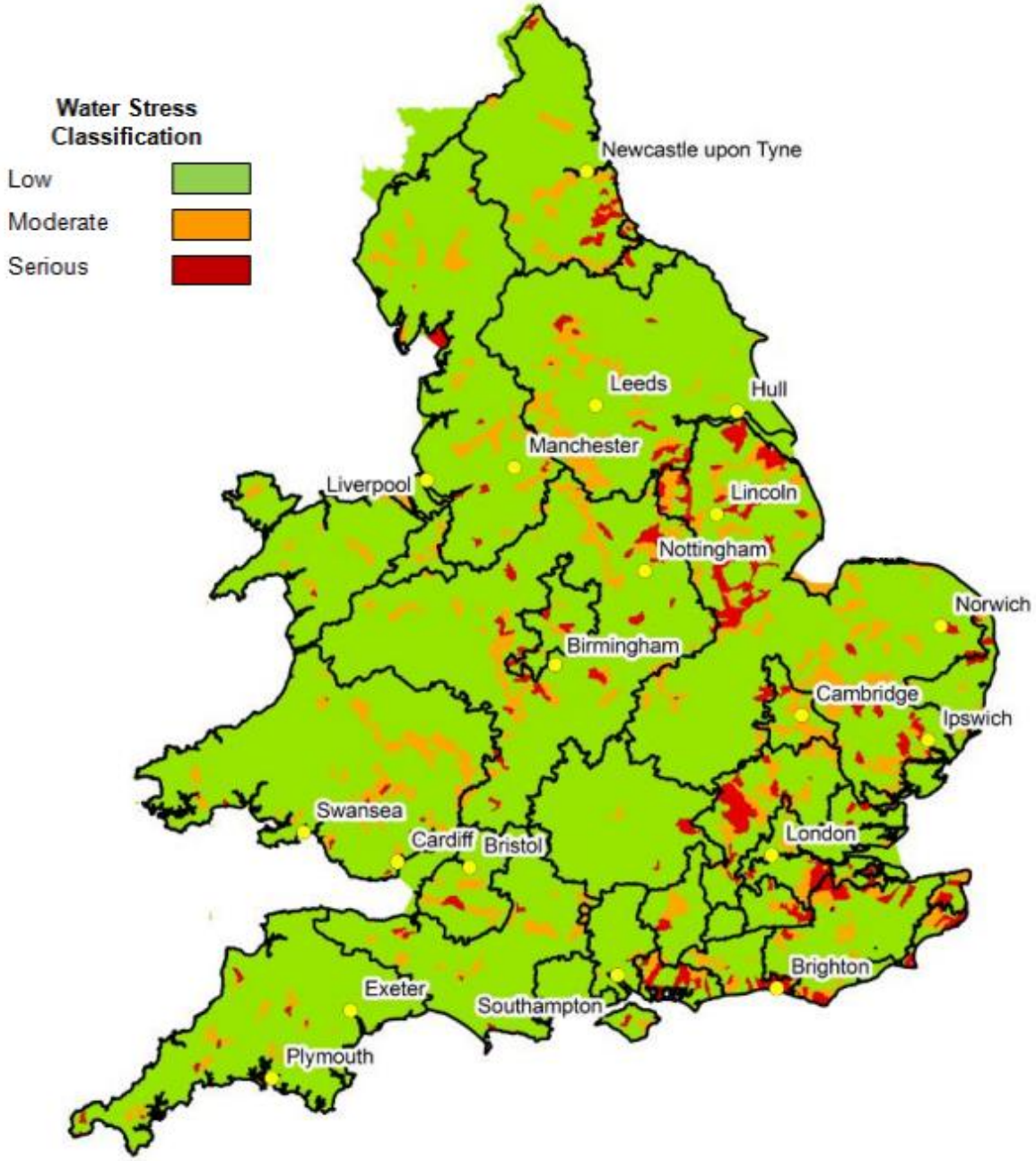


Figure 11 Water stress classifications at the water body scale (EA, 2013: 8)



These classifications were designed to support decisions about metering. The 1999 Water Industry (Prescribed Conditions) Regulations were amended so that water companies operating in areas of serious water stress were obliged to consider water metering alongside other options when compiling their WRMPs. Prior to these amendments, water companies that wished to pursue compulsory metering had to apply to the Secretary of State at DEFRA for 'water scarcity status'. In determining whether it was appropriate to deem an area as water scarce, the Secretary of State was then obliged to consult the EA, Ofwat and customer representatives regarding the projected supply/demand relationship for the forthcoming decade. Granting the application disapplied the statutory right of established household customers in the designated area to remain on an existing unmeasured basis of charging. It was under this original protocol that the (former) Folkestone and Dover water company successfully applied to compulsory meter a portion of its supply area.

The amended regulations, supported by the EA classifications, made undertaking compulsory metering more straightforward and served as an important precursor to companywide compulsory metering. Metering was positioned as an important way of securing future water supplies. For instance, the then Environment Minister, Phil Woolas, argued that 'as the impacts of climate change on our weather and rainfall patterns increase… it seems right that… the costs and benefits of compulsory water metering are given consideration' (in Tibbetts, 2007). Nonetheless, it is important to note that the government did not set national targets for (compulsory) water metering; a decision that disappointed the House of Commons Environment and Rural Affairs Select Committee (EFRA, 2012). Moreover, the government was not introducing an unmitigated 'green light for metering'. Rather water companies operating in areas of serious water stress were expected to consider introducing compulsory metering (Defra, 2007b). Companies would still have to provide a positive cost benefit analysis for their prospective metering programmes (Defra, 2007b; Ofwat, 2011e).

Momentum towards universal, compulsory metering gathered pace with the publication of the 2009 Walker Review, entitled the *Independent Review of Charging and Metering for Water and Sewerage Services*. The Walker Review team concluded that water metering was fundamentally important in addressing water stress in the South East of England. Walker recommended that, starting with areas of serious water stress, 80 per cent of households should be metered by 2030. Such a positive exposition of metering led to some stakeholders describing the 2009 Walker Review as a 'watershed moment for metering', giving a sense

that a future charging system founded on metering was inevitable (**consumer group interview 07.03.2012; consumer group interview 27.03.2012**). Even organisations that have historically rejected metering outright, for example AgeUK, now accepted that metering would be the future of the water charging system. With this positive endorsement in mind, some of the water companies in the South East of England included compulsory companywide metering schemes in their 2010-2015 business plans and 25 year WRMPs, two companies commenced programmes in 2011.

The decision to pursue compulsory metering for water companies operating in the South East of England was taken primarily as a means to tackle water stress. Debates over fairness were secondary, at least to begin with, to attempts to measure and manage water stress. The meter had become a technical exercise that represented a means of cost effectively securing the network. While previous governments had considered metering to be desirable yet unfeasible, due to either political or financial cost, drought in 2006 and the subsequent Walker Review in 2009 provided the political leverage to make metering possible on a scale that had been, until that time, considered impracticable. Dominant discussions about compulsory metering did not place economics in conflict with biopolitics, instead the two were perceived to be complementary.

5.9 Conclusion

This chapter developed a genealogy of water metering from 1960 up to 2009. In doing so it made two contributions. First, it demonstrated that the meter, as a contingent technology, has been instrumental in struggles to negotiate and renegotiate how water and water users are governed. Secondly, this chapter, read in conjunction with chapter four, provided context to the introduction of companywide compulsory metering in South East England. The chapter examined the different ways that the meter has been deployed to govern water and water users. It shows how different ways of understanding the waterscape have been expressed through metering programmes, or in the case of 1950s and 1960s, the absence of metering programmes.

The chapter traced the decline of dominant supply side solutions and the rise of metering as a viable demand side solution. It explored how debates about metering evoked competing understandings of how water should be managed. The chapter also examined the different

ways meters can be used to influence the way water users are governed. In a similar vein to how the focus of Foucault's work on governmentality changed from discipline to securing life, approaches to water metering have evolved from a means to discipline demand and payment to a way of securing life by addressing water stress. Here, as Furlong (2010) suggested, the meter can be an important way of mediating changes in the waterscape. Yet, it is important to recognise that these attempts to instigate change are not always successful and are often partial. Nor were the transitions between different uses of the meter linear, rather they were struggled over. These struggles represent broader debates about what the waterscape should look like. This chapter shows that the water meter cannot be detached from the social and economic processes that flow around and through the technology. This genealogy of metering is vital for better understanding how contemporary compulsory metering programmes in South East England contribute to reproducing the waterscape. By exploring the role metering has played in mediating specific understandings of the waterscape, this chapter has served to historicise debates about metering that are being had in the present day.

What is most interesting here is the persistence of debates and tensions surrounding the perceived fairness of introducing water metering across the two chapters. In this sense the two chapters show how debates surrounding metering have, to differing degrees, placed biopolitics in conflict with economics. Consistently, metering has been depicted rather crassly as either an unjust, disproportionate tax on the poor and a public health threat or an 'instrument of fairness' that enables water users to 'pay for what you use' and can help mitigate against water stress (Strang, 2004). The oscillating conflicting and complementary relationship between economics and biopolitics had been set in motion by the introduction of the Deacon Waste Water Meter (see previous chapter) and continued to be debated through different metering technologies. Here different targets formed the object of government and each metering intervention sought to influence the way that water and water users were governed in different ways. By the advent of contemporary compulsory metering programmes in the South East of England, dominant stakeholders perceived the type of market economics facilitated by metering to be vital for securing the waterscape. 'Paying for what you use' by metering was understood to be the optimum way of securing the socio-natural waterscape by heightening water users' understanding of the 'value' of water and encouraging water uses to reflect and economise on the ways that they engage with water. By this point, economics and biopolitics were understood to be mutually reinforcing. In

Foucauldian terms, expressed through metering, a governmentality had emerged where through processes of self-governing, the population was the target and the economy was the primary form of knowledge and apparatus for securing the waterscape. In this sense, water meters have proved to be an important fulcrum around which understandings of fairness in relation to water have been articulated, negotiated and renegotiated. The water meter, as Feenberg (1999) and Coutard and Guy (2007) suggest, is an ambivalent technology that has the potential to mediate a variety of waterscapes, none of which are inevitable.

The following chapter explores the ambitious companywide compulsory water metering programmes being undertaken in South East England by SRN and SEW. Chapter six explores how contemporary companywide compulsory metering programmes have, informed by behavioural economics, been used to usher in alternative understandings of how water and water users should be governed. The chapter argues that while compulsory water metering was initially perceived as a technical exercise to settle a supply/demand imbalance, compulsory metering programmes developed into a much more expansive socio-technical fix that actively intervened in how people understand as well as relate to water and sought, at least partially, to tackle water stress while ensuring the continuation of a broadly neoliberal waterscape. In this sense, the transition to universal, compulsory metering in some water company areas in the South East of England has profoundly influenced attempts to govern water and water users.

6 Compulsory metering in South East England: Moments of sociotechnical change and the emergence of a sociotechnical fix

6.1 Introduction

This chapter probes the extent to which compulsory metering either reproduces the existing waterscape or opens up avenues for alternative productions of the socionatural waterscape. Compulsory metering in South East England has reframed the way that water and water users are governed. Overall, this chapter argues that contemporary compulsory metering programmes have been deployed as a sociotechnical fix where the water companies in question have attempted to, at least partially, resolve a tension between water stress and household water demand and, at the same time, secure the continuation of the broadly neoliberal shape of the water sector. In particular, a shift has occurred whereby metering installation is no longer perceived as an engineering solution, or a purely technical fix. Instead, the meter is considered to be one part a broader programme of change where new ideas such as behavioural economics have been adopted, different ways of understanding nature have been promoted, interventions in everyday life have been pursued and understandings of fairness have been renegotiated. This chapter argues that the best way to theorise this shift is through bringing together Harvey's recent work on moments and Foucault's work on governmentality because, notwithstanding perceived critical differences between these two positions (which are explored in chapter two), doing so enables close analysis of governing and self-governing processes. Foucauldian concepts are useful in analysing the processes of self-government associated with compulsory metering, Meanwhile, Harvey's moments are used, loosely, to help explain how different moments of the sociotechnical fix co-evolve, dialectically and dynamically, to reproduce the neoliberal waterscape.

The chapter focuses primarily on two compulsory companywide metering programmes in the South East of England: SRN's *Universal Metering Programme* and SEW's *Customer Metering Programme*. These two companies included compulsory metering schemes in their respective 2010-2015 business plans (SRN, 2010; SEW, 2010). SRN's metering plans were the more ambitious of the two; SRN intended to meter 93 per cent of its customer base by

2015 whereas SEW expected to meter 92 per cent of its customers by 2020.[30] SRN outlined a five year programme to install 500, 000 meters. Meanwhile, under its 10 year programme, SEW pledged to install 200, 000 meters by 2015; this represents around 70 per cent of SEW's customer base. Prior to compulsory metering, 40 per cent of households in SRN and SEW's constituencies were metered. Thames Water did not include a compulsory metering programme in its 2010-2015 plan. However, it has recently announced that it plans 'to increase the proportion of homes with a meter from 30 per cent to 50 per cent' (Thames Water, 2013b: 15). Thames Water has a high proportion of properties within its constituency that are difficult to meter due to shared piping, therefore it is unlikely that it will be able to achieve the same rate of meter penetration as SRN or SEW. Nonetheless, Thames Water 'aim to meter 78 per cent of properties by 2040 and anticipate installing bulk meters in all buildings (ibid). Thames Water call this a 'progressive metering programme' and anticipates commencing metering in London from 2014 and meter installation in areas outside the capital from 2020 (Thames Water, 2013b: 26). As Thames Water's metering programme has not been implemented, this chapter analyses SRN and SEW's programmes in greater detail. However, where appropriate, Thames Water's plans are referred to.

In order to illustrate how these compulsory metering programmes have been deployed as a sociotechnical fix, and better understand the processes through which water and water users are governed, this chapter is loosely structured around Harvey's work on moments (technology, ideas, institutional arrangements, relations to nature, social relations, everyday life and relations of production, see chapter two) and draws on Foucault's notion of governmentality. The chapter is loosely based on Harvey's moments in the sense that they are not treated as ahistorical categories and moments that are specific to the contemporary compulsory metering programmes are identified. This is most clear in relation to the moment Harvey describes as 'institutional arrangements' which is better understood as a changing role for the private water company (see further below).The chapter moves across the different moments that combine to create the sociotechnical fix that operates through compulsory water metering. Although the chapter takes inspiration from Harvey's work, the moments in this chapter do match perfectly with Harvey's; the moments of sociotechnical change are specific to compulsory water metering in the South East of England. The 'moments' in this

[30] Companywide compulsory metering programmes are unlikely to apply to the whole customer base. In cases where to install a meter is deemed too costly, for instance where there is shared plumbing, households would be placed on as assessed charge. These are based on the number of bedrooms in a home or whether the property is occupied by one person. The reasoning is that there remains a loose correlation with water use.

chapter are separated out for methodological purposes and should not be understood as easily demarcated, pre-given, stable and absolutely independent entities. In this sense, as Hartstock notes, 'the concept of "moment" can... be analytically useful in both separating out the social relations the theorist wants to concentrate on while reminding us that these social relations are in fact connected with and defined by other social relations and with their own pasts and future possibilities' (Hartstock, 1998: 709). This focus on moments, as Linton argues, 'provides a more subtle understanding of historical change than the standard dialectic (Hegelian or Marxian)… [and] a rather unconstrained historical process that emerges as an internally relational dynamic rather than a sequence determined by any particular force or logic' (Linton, 2010: 32-33). Harvey's approach emphasises the messy and dialectical character of sociotechnical change. Meanwhile governmentality approaches reinforce Harvey's insights by providing tools for exploring the particular ways that water and water users are governed through sociotechnical change, particularly in relation to processes of self-government. Overall, this chapter argues that the way these moments come together can be understood as a sociotechnical fix. In this context, the waterscape is reproduced in a way that seeks to address some of the tensions within the water sector (for instance tensions between water stress and domestic demand) while, at the same time, strengthen the neoliberal characteristics of the sector.

The chapter begins by examining how the newly introduced Revenue Correction Mechanism (RCM) resolved a tension in the water industry between revenue volatility and metering. This section argues that by lowering the water companies' exposure to risk, this mechanism had the effect of securing the continuation of the neoliberal relations of production that shape the water industry. Subsequently, the chapter demonstrates that the use of smarter metering technologies enabled water companies to be more ambitious in shaping how water and users are governed through the promotion of behavioural economics. The chapter then examines how the adoption of ideas from behavioural economics, particularly Thaler and Sunstein's work on nudge (see chapter two), has, as a form of governmentality, contributed to reshaping the waterscape through water metering programmes. The next section of the chapter argues that compulsory companywide water metering represents a substantial change to the way that water companies have traditionally operated and sustained relationships with household water users; there is greater emphasis on the companies' role as a customer service provider. The chapter then moves to explore how water metering programmes promoted a different way for water users to understand water, articulated around a notion of fairness that closely aligned to

neoliberal inspired cost recovery approaches, and enabled companies to intervene in water users' everyday engagements with water, albeit on a partial basis. Here, this chapter moves across the different moments of the sociotechnical fix and exposes the productive tensions between Harvey's work on moments and Foucault's insights on governmentality that are mutually beneficial for analysing how the waterscape is negotiated and renegotiated through compulsory water metering.

6.2 Reducing volatility: reproducing neoliberal relations of production

Despite assumptions to the contrary, compulsory water metering is not a crude accumulation strategy. The RCM does, however, facilitate the continuation of existing relations of production in the water sector by resolving a tension between widespread metering and revenue volatility. Previously, as chapters four and five highlighted, water companies have been reticent to embark on extensive metering programmes due to the unpredictable impact on company revenue. Paying for water by volume, rather than a flat fee, has the potential to create uncertainty and makes it more difficult for companies to forecast their income. This section argues that the introduction of Ofwat's RCM removes the risk of revenue instability previously associated with metering and, in turn, contributes to a sociotechnical fix where some of the tensions in the sector are resolved while, at the same time, the neoliberal characteristics of the industry are strengthened.

In England and Wales water prices are set every five years and price limits are approved by Ofwat (see Table 10). When setting the price limit, Ofwat do not set a limit on company profits yet they do allow companies to make a 'reasonable return' so water companies are able to finance their functions. Prices set for metered customers cannot be considered outside of the broader price setting process.

Table 10 Construction of water charges across the UK (adapted from Tinson and Kenway, 2013: 6)

Country	Charges
England	Prices set by Ofwat every five years. The formula for doing so is known as RPI+K where RPI is the Retail Price Index inflation measure and K is an additional measure for investment and profit.
Wales	Same process as England.
Scotland	Set by Water Industry Scotland Commission. Charges reflect values determined by Scottish Parliament and are based on council tax rates.
Northern Ireland	Households do not pay a specific water charge. The cost of water is included in regional taxation. The company is largely funded by government subsidy. Plans to introduce water charges have been delayed several times since the Northern Ireland Assembly reconvened in 2007.

When asked why companies were pursuing compulsory metering, domestic water users often presumed that the water companies' motive was the pursuit of profit. As the following two quotations show, even in cases where interviewees cited environmental reasons or network security as key factors, households also tended to offer profit making as a core motivator in the decision to introduce compulsory water metering:

I don't think that they are doing it entirely for environmental reasons… I'm sceptical because I think they might just increase the prices – they'll have to, at least to pay for the meters. Water will become more expensive, you have no choice but to pay more. That is where they get you (Household interview: Rosemary, retired 1 person house: SEW).

You would like to think that they're trying to make people more efficient. It's probably for two reasons. The first is money. Lots of people are using water that they're not paying for, so they'll make money from that... But they would also be regulating their use of water, so then they would know exactly where their water supply is going (Household interview: Dave, retired, 2 person household: SEW).

Although domestic water users often assume that metering is a crude accumulation strategy, the RCM and the broader price setting process make the situation more complicated. Here, the RCM plays an important role by removing the 'scope for a company either to over-or under-recover revenue' relative to the assumptions Ofwat have made when determining price

limits (Ofwat, 2009). It allows Ofwat to adjust the price limit in response to under or over recovery. As a result, metering should not materially affect company revenue. Any profit accrued beyond the price limit as a result of metering should be returned to customers and, similarly, companies can claim for unanticipated losses in future price increases.

The RCM performs a second important role, according to Ofwat the RCM 'removes the disincentive for companies to promote water efficiency measures' and 'provides a financial incentive for the companies to use water wisely' (Ofwat, 2011c). Before the RCM was introduced, metering represented a risk for companies due to potential revenue reductions should less water be consumed than initially anticipated in the assumptions informing the price review process. Therefore, there was a perverse incentive for companies to encourage high water use from metered customers.

The introduction of the RCM is particularly important because, according to CCW, any increase in uncertainty about revenue streams could have an indirect impact on household water bills because it 'will lead to higher borrowing costs and shareholders will want to be rewarded for greater risk' (CCW, 2010a: 9). When the research for this thesis was conducted, there was no clear evidence regarding the influence widespread metering might have on company revenues. However, prior experience suggests a higher degree of uncertainty and potential volatility, commenting on Veolia South East's (now Affinity Water) experiences, CCW water highlighted that

In addition to year on year volatility, which depends on weather to a large extent, there will be the substantially uncertain effects of changes in household consumption following on from metering and the various other potential influences on household behaviour. Early experiences of Veolia South East indicates a greater reduction in revenue through volumetric bills than forecast. How far this is the result of being transferred to a meter or due to previous over estimations of PCC is uncertain. But water companies experiencing significant revenue shortfalls will seek to increase their charges through Ofwat's revenue correction procedures and doing so will increase customers' bills and potentially lead to a serious destabilisation of revenues… Even at low levels of meter penetration, several companies made part of their case in the recent price review that revenues had been depressed by and had not yet recovered from reduced levels of consumption associated with the drought of 2005 (2010a: 7).

The RCM has been welcomed by companies, for example, Affinity Water stated in its 2011 June return that:

The high level of metering penetration and our success in promoting water efficiency has made us particularly vulnerable to the risk of under-recovering income. Consequently we are pleased that the Revenue Correction Mechanism is now in place. This regulatory improvement has removed the principal financial risk to which we were previously exposed (Affinity Water, 2011: 4).

The importance of the RCM for stabilising existing relations of production was further underlined by pressure from ratings agencies following the introduction of compulsory metering. SRN, one of the most heavily geared water companies in the industry (see chapter one), has experienced pressure from ratings agencies following revenue uncertainty, in part, due to the implementation of its compulsory metering programme. In 2011 Moody's rating agency downgraded SRN's debt status to two notches above junk with a negative outlook. This, according to the Financial Times, was the lowest rating of any of England's nine water companies since privatisation in 1989 (Gray, 2013). Moody's decision to lower SRN's rating followed a revenue shortfall resulting from lower than expected consumption levels. In the following year, Standard & Poor's (S&P) rating agency threatened to downgrade SRN's credit rating and issued a negative outlook for SRN's debt status, again citing weak cash flow as the primary motivator for this warning. S&P concluded that SRN's cash flow problems could be in part attributed to a 'revenue shortfall resulting from its overestimate of the amount it would charge metered customers during the 2010-2015 regulatory period', which of course is when the compulsory metering programme commenced (Water Briefing, 2012). S&P were also of the opinion that metered customers 'might consumer less water due to restrictions imposed as a result of drought' which would then lead to a further reduction in revenues (ibid). This shows how undertaking compulsory metering can lead to revenue uncertainty and, potentially, increases in the cost of raising capital and changes to a company's debt rating. More recently, in September 2013, Fitch Ratings announced a stable outlook for SRN's debt rating, suggesting that SRN would not face negative rating pressure in the immediate future. This is in part due to under recoveries in the region of £150m being returned to the company under the RCM (Reuters, 2013). The RCM, then, played a strong role in stabilising what would otherwise be an important unintended consequence. Without

the RCM, metering, at least in the short term, posed a challenge to the relations of production that shape the water sector through revenue instability.

Here, the RCM plays an important role in resolving a tension in the water industry between revenue volatility and metering. This has the effect of stabilising metering and the broader, largely neoliberal, relations of production that shape the sector by lowering the water company's expose to risk. However, it does not, and is not designed to, issue a challenge to the existing ways of organising the waterscape. This reduction of risk allows companies to pursue metering and is part of a sociotechnical fix that seeks to solve tensions at work within the sector and strengthen the neoliberal characteristics of the waterscape.

6.3 Technology, becoming smarter?

This section focuses on the moment of technology. It examines some of the recent innovations in metering technologies that have co-evolved with other moments to reproduce the waterscape. Smarter meters, as a governmental technology, play an integral role in influencing how water and water users are governed. This section argues that the new technologies being circulated within the South East of England enabled water companies to proactively interact with, and intervene in, how water and users are governed through the promotion of behavioural economics and by reshaping how relations to nature are understood. In this sense, the introduction of different forms of smart metering technologies, has, to an extent, resulted in the breaking out of what Graham and Marvin (2001) have described as the 'black box' effect where the myriad socio-natural relations that surround and course through the meter are reduced, simplified and, at times, hidden from view.

Most meters used in England and Wales are 'dumb' meters. These meters do not have the capacity to record readings at different times or support the use of associated technologies such in-house displays (IHD) which, in turn, can be used to communicate water use data with water users and ideas such as behavioural economics. Despite being hidden underground outside, and being relatively isolated from the water user, the dumb meter had been understood in the 1990s as possessing the necessary abstract qualities to exercise the type of causative power necessary to deliver substantial changes in the waterscape (see chapter five). It was assumed that the mere installation of a meter would alter the way water users engaged with water and enable water companies to deliver radical demand reductions.

Interviewees argued that, commonly, metering had been understood by companies as an engineering problem. Here the question at the forefront of the utility was how to best run the operational side of metering installation; or 'how to get meters in the ground'. However, water metering has never been, and can never be, a purely technical intervention as this implies that the technology can be materially separated from ideas that shape its construction, the water that flows through it as well as the user who interacts with it. Faith in the mediating role of metering technologies (see chapters four and five) has not disappeared yet water companies undertaking companywide compulsory metering have identified the limitations of dumb meters, and have opted for smarter versions which provide a platform for proactively engaging in water users' everyday interactions with water.

The available technological options for metering have expanded and companies are increasingly opting for smart(er) technologies. There is no agreed definition of smart metering but, often, it refers to a system rather than just a device. Smart metering systems are characterised by greater communication flows between water user and utility, greater capacity for data storage, remote data collection, and 'intelligent' use of that data to inform policy. Table 11 broadly outlines the different metering systems that are available.

Table 11 Characteristics of different metering systems

Type of system		Typical characteristics
Dumb Meters		Meters are manually read twice a year and the information garnered is used primarily for billing purposes and to provide the user with limited information about water use. Leaks may be detected following a rapid increase in the bill.
Semi Smart Meters	Automatic Meter Readers (AMR)	Meters are fitted with a Radio Frequency transmitter to support walk by/drive by reading which allows the company to reduce its operations costs. Meters often continue to be read twice a year but the technology tends to capture monthly indexes which can be used to produce more information about water consumption. AMR meters usually have an alarm which detects leaks and alerts the company to tamper attempts, low battery and other mechanical problems.
	Intelligent Meters	Fixed network with greater flows of information. Meters can be set to record information at range of intervals (i.e. 15 minute/ 1 hour intervals), the information can then be used for billing, providing information about consumption and network management.
Fully 'Smart' Meters/ Advanced AMR systems		Fixed network with two way information flows which allow for active management services. Readings are transmitted

	without the need for a human to take a physical reading at the site. IHDs, real-time water usage data tend to be available. Potential integration with smart energy meters and allows faster detection of leaks inside the home.

Unlike the energy industry where the government has supported a universal, albeit delayed, compulsory nationwide smart metering programme complete with IHDs and a coordinated public information programme, each water company pursuing compulsory metering has held its own procurement process and taken different technological routes. Both Southern and SEW water have chosen varieties of 'smarter' technologies, although SRN's system has additional 'smart' functions. Importantly, metering is not seen as an end in itself. Water companies see smart metering as 'an essential prerequisite' to ensure that water efficiency and leakage targets are met (SEW, 2010: 189). The approach to compulsory metering undertaken by each company is summarised in Table 12.

Table 12 SRN and SEW's metering strategies

Company	Metering Strategy
Southern Water	SRN use AMR technology supplied by Arad. These meters facilitate drive by metering, are read on a six month cycle and return 12 month end readings. The meters have data loggers that can store 5.5 months of hourly readings. The meters are equipped with leakage alarms. Household water users are able to access a customer web portal which details the latest meter information. A key fob can also be used to access real time meter information, thus removing any need for the customer to manually read and inspect the meter.
South East Water	SEW use AMR supplied by Elster. Meters can be read on a walk by basis and the system is upgradable to drive by. This system has been described as a 'semi smart' because 'you do not have to put your head down a pit to read a number but you have to be quite close to it for the technology to work' (**interview conducted on 15.11.2011**). The meter can store data and reports monthly and weekly readings. In the future SEW intend to move to a fixed network system.
Thames Water	Undertaken fixed network district metered area (DMA) trials. Thames use a conventional AMR technology provided by Homerider Systems/Vensys and an advanced AMR programme that use LR radio to report readings rather than repeaters. Thames has been using these trials to inform its mains replacement programme. Thames water will undertake a 'progressive metering' programme.

Although the metering programmes are compulsory, SRN has had to make concessions after some customers rejected the specific metering technologies supplied by the company. SRN use meters manufactured by Arad; an Israeli company which also develops water meters for the Israeli state owned company called Mekorot. Corporate Watch have criticised SRN's decision to work with Arad due to its relationship with Mekorot which, it argues, supplies water in illegal settlements and denies water to Palestinian communities (Corporate Watch, 2013). At least one household has refused an Arad meter. The Palestine Solidarity Campaign in Brighton & Hove has also launched a campaign to boycott meters supplied by Arad. Its campaign has been publicly supported by Keith Taylor MP and Norman Baker MP and, so far, a small number of water users have joined the campaign (Brighton Palestine Solidarity Campaign, 2013). Here is important to emphasise that these particular water users were not necessarily rejecting the principle of compulsory metering, only that the meters that had been manufactured by Arad. SRN initially responded to complaints by stating that metering was compulsory and non-negotiable yet, later, it compromised and installed a refurbished dumb meter that had been previously installed elsewhere on its network and developed by a different supplier (ibid). This serves as a reminder that the meter should not be divorced from the socio-economic circumstances in which it is situated and that, as Rutherford (2007) has emphasised, attempts to alter the processes of governing, in this case water and water users, are rarely smooth and are often met with contestation.

Nonetheless, the introduction of smarter metering technologies provided a platform for water companies to develop a relationship with the water user and to better understand, as well as more proactively engage with, waters' understandings of nature and water practices. While the meter is still a central consideration, metering is no longer understood, purely, as an engineering problem or solution. For instance, Dr Jack Carnell, National Chair of Energy and Utility Skills (and former Managing Director of South Staffordshire Water Plc), opened the Society of British Water and Wastewater Industries (SBWW) 2011 annual Metering and Leakage Seminar by stating that

Arguably, I believe that metering is the most important issue in the sector… There's a war going on out there called climate change. Just putting the meter in there won't fix it. We need to get serious about the economics… we have to ensure that customers understand the cost of water (Carnell, 06.12.2011).

Here Carnell highlights the continued importance of the meter yet also emphasises that meter installation alone is insufficient to deliver demand reductions. He argues that more effort ought to be made to ensure that households better understand the costs of water and the economics of delivering it. This would involve mobilising particular understandings of nature as well as specific socially constructed notions of fairness which, in turn, would require interventions beyond the installation of a meter. Water company employee interviewees noted that this represented a shift in how companies approached metering, as Crooke notes, SRN in particular

Are keen to stress that they are not implementing an installation programme; they are, in fact, overseeing 'a customer journey'. Whilst getting the meters in the ground on schedule is obviously important, a key priority is to help customers understand why meters are being installed, offer advice and support to help them reduce their water use and make the most of the opportunity to reduce their water and energy bills (Crooke, 2011: 228).

In perceiving metering programmes as more than metering installations, water companies have, to an extent, shed light on the complex and messy socionatural and sociotechnical relationships at work throughout the waterscape. Through its consideration of how water users engage with the metering technology and how households relate to water, compulsory metering programmes have been able to approach tensions within the industry with greater dynamism, cutting across a number of the moments described by Harvey. By engaging with multiple moments, the compulsory metering programmes have emerged as a sociotechnical fix where particular reproductions of the socionatural waterscape are projected. This involves invoking specific understandings and rationales of how water and water users should be governed. The next section, demonstrates how water companies have embraced and adopted ideas from the field of behavioural economics, as the latest form of governmentality, within their compulsory metering programmes. It argues that these ideas have been used to in an attempt to solve some of the tensions within the waterscape and reproduce the waterscape in broadly neoliberal ways.

6.4 Ideas: Nudging behavioural change

'We should be using metering more as a carrot than a stick'

Anne McIntosh, Conservative MP, Chair of the Environment, Food and Rural Affairs Committee, APPWG 21.02.2012.

This section examines the way ideas from behavioural economics have been taken up through the compulsory metering programmes in the South East of England. Behavioural economics, specifically Thaler and Sunstein's ideas surrounding nudge, have become influential in policy making spheres over the last ten years. So much so that Huxley (2011), Jones et al (2013) and Wilkins (2013) suggest that neoliberalism is currently going through a transition and the particular brand of behavioural economics made popular by Thaler and Sunstein is emerging as a new governmentality (see chapter two). This section argues that the adoption of these ideas represents a key moment in how the waterscape is governed. Water companies have used some of the technical advances associated with smarter meters to facilitate nudge-style approaches. Nudge inspired ideas have helped to partially transform, yet ultimately complement, existing neoliberal framings of the waterscape. This chapter examines how this new form of governmentality helps to renegotiate understandings of nature, fairness and the role of the water company.

Behavioural economics, to varying degrees, has become influential in the water industry. For instance, at the 2011 EA Tariff Trials Workshop, John Borne, Defra's Deputy Director for Water Supply and Infrastructure, Water Availability and Quality Programme, issued a challenge to those present to build on recent work in behavioural economics and consider how nudge could be best adopted in the water industry in order to encourage households to use water more efficiently. Moreover, Ofwat has administered a series of modest targets for companies to 'help customers to save water' (Ofwat, 2010c). These include an annual target for each company to save at least one litre of water per property a day, on average, by promoting water efficiency and a requirement to provide information to consumers on how to use water more wisely (Ofwat, 2010c: 18). In fulfilling these targets, it was envisaged that companies would include behavioural change programmes as a key part of its basket of policy options. The most explicit reference to nudge materialized in Ofwat's 2011 paper *Push, pull nudge: how can we help customers save water, energy and money*. In keeping with

the language of nudge, Ofwat argued that 'the way we use water is deeply ingrained' and 'we do not tend to make conscious decisions about how much we use and we are unlikely to change our habits without being prompted' (Ofwat, 2011a: 5). The paper identifies three ways of 'prompting change': by pushing, pulling and nudging (ibid). Here push refers to 'setting standards for water saving devices' and includes regulations for fittings and new homes. Pull refers to 'rewarding customers for using water wisely' by improving price signals and charging the 'customer for what they use, so that they pay less if they use less' (Ofwat, 2011a: 5-6). Meanwhile, nudge is described as being

About understanding customer behaviour and using it to promote change. It draws on best practice in advertising and marketing to encourage consumers to change their water-using habits. It is something that government, the regulators and those providing services to consumers can all use (Ofwat, 2011a: 5).

Throughout this document, Ofwat emphasised the importance of metering programmes as a conduit through which nudges are facilitated. Here Ofwat focused on the importance of restructuring the water charging system to provide households with financial incentives to save water and, in recognition that humans do not always act rationally, organising the charging structure so that the "decision" to use less water is made easier. Ofwat argued that metering, as part of a nudge strategy, is desirable because

People waste water when the benefit they get from using it is less than the cost of supply, including wider social and environmental costs. Using this definition, we can start to see some of the reasons why we might waste water even though it is in all our interests to use it wisely. The most obvious is that the price we pay for water does not reflect the cost of supply. So we are unable to compare the costs and benefits when we decide how much water to use. Unmetered customers pay a fixed fee, but then pay nothing at all for each unit of water they use. Even metered customers pay less than the cost of supply. Metered charges reflect only water company costs which cover some but not all of the environmental costs of supplying water, and removing and treating wastewater (Ofwat, 2011a:5).

The language in Ofwat's report, in particular its focus on non-rational decision making, clearly speaks to Thaler and Sunstein's ideas surrounding nudge. However, before continuing, it is important to highlight some of the potential problems of identifying

compulsory metering programmes as a form of nudging. Most of the points of potential conflict revolve around the relationship the relationship between nudge and freedom (see chapter two) in the context of *compulsory* metering.

On first inspection the compulsory element of metering appears to be at odds with the nudge thesis due to its prescriptive nature. Thaler and Sunstein make very clear that 'nudges are not mandates' (2009: 8). Here, as Huxley (2011) highlights, both nudge and governmentality approaches involve, and place considerable emphasis on, the production of freedom. Despite their aversion to compulsion, it appears that Thaler and Sunstein make some exceptions, they argue that 'when incentives are badly aligned it is appropriate for government to try and fix the problem by realigning them' (2009: 196). Here they have in mind 'taxes or penalties on those who pollute' and 'cap-and-trade systems' (ibid). They argue that 'despite its coercive features, this basic approach is, in a sense, a cousin of libertarian paternalism, because people can avoid paying the tax by not creating pollution' (ibid). In this context, Thaler and Sunstein maintain that 'liberty is much greater when people are told, "you can continue your behaviour, so long as you pay for the social harm that it does" than when they are told, "you must act exactly as the government says"' (2009: 196). Then, using the language of nudge, compulsory metering can be understood as a 'cousin' of the idea because, despite being mandatory, the meter creates an incentive to save water/money but does not require the household to respond to that incentive; therefore an element of "choice" supposedly still remains. Nudge in this sense manufactures a particular understanding of freedom, a perceived freedom to choose how much water is used in the home. Companies undertaking compulsory metering have attempted to divert attention away from the compulsory element of the metering programmes. For instance none of the compulsory metering programmes refer explicitly to compulsion in their title. SRN has coined its programme the Universal Metering Programme, SEW has called its scheme the Customer Metering Programme, whereas Thames Water's forthcoming metering programme is referred to as Progressive Metering. In this sense, metering helps to produce notions of freedom that centre on choosing how to use water and downplay the compulsory aspect of metering.

In this context, companies administering compulsory metering programmes have emphasised that meters should not be understood as a means of limiting freedom to use water but a means to empower water users by giving 'the customer advice about what they can do to reduce their consumption' and urging 'customers to be more conscious and aware of the

environmental costs of water consumption' (**water company interview, 12.12.2011**). Here the meter is portrayed as a facilitating tool that enables nudging, rather than as an end in itself. Similarly, Ofwat suggest that, as a result of metering, households are presented with the option to use less water and therefore avoid a higher water bill. Importantly, for Ofwat, this is 'not about restricting or interfering with customers' freedom to choose … [as] [t]hey can always give choices the cold shoulder' (Ofwat, 2011a: 18). Architects of compulsory water metering emphasised that 'ownership and accountability [for water use] should be with the customer' and that metering programmes are 'about encouraging the customer to go out and find out more and providing enabling tips' rather than the company 'telling the customer what to do' (**water company interview, 12.12.2011**). In this sense, compulsory water metering programmes are consistent with Thaler and Sunstein's ideas surrounding nudge and represent the emergence of a new, or at least altered, governmentality that attempts to strike a balance between promoting freedom and structuring choices in a way that benefits both the individual and society more broadly. Metering programmes, despite being compulsory, do not exercise any explicit coercion. Other than higher water bills, there are no direct penalties for not 'saving water'.

The meter enables a different way of structuring choices, by introducing financial incentives and providing feedback on water usage patterns, yet it does not force households to use water in particular ways. Instead, metering programmes promote a particular way of understanding water and governing water users. The adoption of nudge style strategies, as a new form of governmentality, then has profound implications for how the waterscape is produced, particularly in relation to how water and water users are governed in and through compulsory metering. In turn, nudge inspired approaches associated with compulsory metering contribute to producing a sociotechnical fix by managing a tension between freedom and perceived profligate domestic water use practices while, at the same time, failing to fundamentally challenge the neoliberal notions of choice that shape the waterscape.

The next section focuses on SRN's Universal Metering Programme and SEW's Customer Metering Programme to show how water companies' use of smarter metering technologies and nudge style behavioural economics are dialectically related to changing role of the water company in the sector. Specifically, the chapter focuses on the enhanced role of customer engagement strategists as water company attitudes to metering programmes evolve.

6.5 Seismic change? Water companies as customer service providers

Harvey identifies 'institutional arrangements' as a key moment. This section focuses on the changing role of the private water company as this a particularly important issue in relation to contemporary compulsory metering programmes. This is not to say that other dimensions of institutional arrangements in the water sector are not important. Chapter one outlined the key role that the Ofwat, and other regulators, typically play in influencing which policies are adopted and implemented in the water sector. Chapters four and five also highlighted the respective roles Ofwat and the EA have played in influencing metering policy. This section focuses on the changing role of the private water company because the role of the company has evolved directly in relation to the introduction of compulsory water metering. These changes have been key to advancing compulsory metering.

The implementation of compulsory metering represented a challenge to the way that water companies have traditionally operated and sustained relations with its customers for it resulted in the companies communicating with its customers on an unprecedented scale. Both SRN and SEW sought to better understand its customer base in order to gauge how customers would respond to a compulsory metering programme, support customers in adapting to life with their meter and encourage households to use less water. In order to achieve this, both companies developed detailed customer engagement strategies. Typically water companies have had little direct contact with their customer base other than processing bill payment. Consequently, companies undertaking compulsory metering found that they needed to develop new skills and strategies for engaging with water users.

According to a water company interviewee who worked closely on the communications strategy for a compulsory metering programme, the scale of change was of 'seismic' proportions (**water company interview conducted on 15.01.2012**). Historically, there has been a disconnect between the company and water user where companies have tended to do their best to stay invisible and as such, according to a consumer group interviewee, have resembled 'ostriches with their heads in the sand' (**consumer group interview, 08.06.2011**). Indeed, a 2011 ICS/You Gov survey found that 'respondents were most likely to label water companies as "invisible"' (Reid and Acutt, 2011). Water Companies undertaking compulsory metering have stressed the importance of developing a relationship with customers regarding metering. For instance SRN's Jo Fielding Cooke told an All Parliamentary Water Group

meeting in October 2013 that its metering programme was designed 'with our customers, for our customers'. The increased emphasis that has been placed on customer engagement in the water industry is further underlined by Ofwat's June 2010 guidance which outlined minimum engagement expectations for large scale metering programmes. Without extensive experience of interacting with customers companies found that it was necessary to make significant changes in order to design and implement a customer engagement strategy to accompany the compulsory metering programme.

There are important differences between the ways that the two companies approached customer engagement. SRN drew more heavily on external agencies, attempted to introduce a more intensive, face to face service and, at least initially, placed considerably more emphasis on continued forms of engagement following metering installation. Nonetheless the approach adopted by the two companies is similar in that both were committed to a more 'customer focused' metering programme and both developed a 'Customer Journey' engagement strategy (outlined in Table 13) which, in turn, facilitated nudge inspired strategies before, during and after meter installation. Both companies placed considerable importance on the customer journey as a positive and proactive way to enrol households in their metering plan. As one water company interviewee noted, the 'main challenge is around taking your customers on the journey, it is around communication and taking the customers and stakeholders with you so they want to do it and they've bought into it' (**water company interview conducted on 15.09.2011**)

Table 13 SRN and SEW's customer journey

Stage	Southern Water	South East Water
Prior to meter installation	Three months prior to the meter installation date SRN placed adverts in the local press (including television) and placed leaflets in public spaces in order to raise awareness about the metering programme. Six weeks before the installation day, customers were issued with a welcome pack informing them when their meter would be installed and with links to further information – SRN had launched a	Six months prior to installation SEW made contact with local media, held community drop in sessions and placed advertisements in specific community locations. Three months before installation SEW made contact with the customer, providing a brochure which informs the customer that the way they pay for water is about to change and 'explains why metering is important for the sustainability of water resources'. This brochure also provides a

	purpose designed website and created a call centre with staff dedicated to the metering programme. One week before installation, SRN put up street signs as a reminder of the impending meter installation.[31]	link to the SEW metering website where customers can calculate an estimate of the bill change they are likely to experience. Two months prior to installation radio campaigns begin. One month before installation, customers were sent a card with an indicative date for installation.
During meter installation	Mobile information units were located in streets were installations were occurring. Contractors knocked on the door of each household to notify customers that meters had been installed, check the technology was working and offer a water audit. Customers were offered water saving shower heads and vouchers for other water saving technologies.	Customers issued with a welcome to your meter pack. It contained information about the tariffs, water efficiency, Direct Debits, a free Hippo Bag and a shower timer. SEW also offered a short water audit, this involved offering devices including a tap and shower aerator.
Post meter installation	Customers were not placed on a metered charge immediately after installation (households do not receive their first metered bill until nine months after installation). Three months after installation, customers were sent an indicative bill that showed household consumption and what their water bill would have been for that period under the new program. Customers who were likely to see large bill increases identified and offered a visit from the Green Doctors (offered a water and energy audit and an assessment to qualify for the social tariff, see	Customers were not placed on a metered charge immediately after installation. Three months after installation, customers were sent an indicative bill that showed household consumption and what their water bill would have been for that period under the new program.

[31] In order to install meters, the company may need to access water users' property and some companies have planned punitive measures to ensure cooperation. For instance, SRN invites households to agree to an appointment. If, after 'extensive effort' to make contact, the company are 'unable to obtain... co-operation to progress the installation of a meter' it switches customers to its No Access Charge. This is a fixed annual charge which prevents the household accessing single occupier discounts, financial assistance through targeted tariffs and means that households ' may well pay more' than if they were charged on a metered basis. The No Access Charge is rescinded should households cooperate at a later date (Southern Water, 2013a: 1)

	chapter seven).	

Notably, in preparing its respective metering programmes, both companies recognised that existing staff capacity would not stretch to producing a grand engagement strategy. The water companies responded by contracting services from external agencies and creating new communication specialist in house positions specifically for the metering programme. SRN approached the Design Council UK, a not-for-profit organisation that provides design advice to industry and government, to appoint agencies to help them better understand how and why their customers use water. Here IDEO, a design and consultancy firm, worked with SRN to research how different categories of water user might react to a metering programme and map the customer journey for its metering programme. SEW also worked closely with partners including the Energy Savings Trust to develop its communication strategy. SRN then consulted customers on its plans and held training sessions with contractors Balfour Beatty, the contractor responsible for meter installation, and Groundwork, a charity employed to deliver SRN's Green Doctor service (see chapter seven for further details). Following regulatory approval for the metering programme, SRN spent 10 months meeting with local stakeholders including AgeUK, local politicians, Housing Associations and the CAB in order to explain the programme and provide an opportunity for any concerns to be voiced. Both companies hired additional employees with communications backgrounds and SRN went a step further by running its metering programme as completely separate operation which would be retrofitted back into the broader company structure at a later date.

These customer engagement strategies are important because they exemplify how companies have responded to challenges within the sector by altering their company arrangements. In this context, shifts towards a more 'customer focused' service, where the company is visibly interacting with water users to implement nudge techniques, has broader implications for how the role of the water company is understood. This is an important change, over the last twenty five years, water companies have typically operated as self-contained companies focused almost explicitly on engineering focused goals to ensure the uninterrupted delivery of water. Now private water utilities, at least those undertaking compulsory water metering, are making greater efforts to deliver a *customer service* rather than merely delivering water. Here water companies have increasingly drawn on third party organisations and adopted more a customer focused communication strategy that challenges previous company priorities. Changes to the water companies' practices represent just one moment in explaining sociotechnical change in

the waterscape. Changes to role of the water company have enabled companies to implement nudge style tactics which, as the following section shows, have helped stabilise particular understandings of water. It is through this coevolution of moments that a sociotechnical fix emerges where some of the tensions in the sector are addressed yet, simultaneously, the continuation of neoliberal characteristics in the waterscape is secured.

6.6 Relations to Nature: Realising the "true" value of water

One of the key messages emanating from the compulsory water metering programmes communications and engagement strategies is that water is not valued appropriately; it is undervalued. The failure to value water appropriately is perceived to be a core tension within the sector and is thought to lead to profligate domestic water use. In this context, there has been a resurgence of interest in pricing issues in the water sector (Defra, 2011), and more broadly in the pricing of ecosystem services (Yusoff, 2011). This has culminated most clearly in the publication of the *Independent Review of Competition and Innovation in Water Markets* (Cave, 2009) and *The Independent Review of Charging for Household Water and Sewerage Services* (Walker, 2009). Importantly, the Walker Review team concluded that the 'biggest issue [in the water sector] is the mismatch between how we value water now and how we need to do so in the future' (2009: 1). In seeking to manage the tension between the value of water and profligate domestic water use, the compulsory metering programmes contribute to reshaping how relations to nature are understood. Here the value of water is conflated with the price of water and the meter is framed as offering new incentives to take 'control' over water and the customers' water bill. Presenting relations to, and the value of, water in simplified, often monetised terms, plays a key role, along with other moments, in reproducing the waterscape in broadly neoliberal ways.

In the absence of metering, it is argued that households do not have a clear indication of the volume of water used or the related costs (whether environmental or financial) of that usage. In this context, Walker made a causal connection between the price of water and how it is valued, arguing that 'we are used to it being cheap and plentiful and so we tend to treat it as having little value' (Walker, 2009:9). The Walker Review team, conflating price and value, concluded that:

There is a disconnect between the current valuation of water and its likely future value. Water today is cheap. When companies abstract water they pay very little for doing so. At the other end of the pipe, a litre of tap water costs less than 1p to supply and take away. At about £1 a day, water bills for most customers are significantly less than energy bills (Walker, 2009: 47).

In order to bridge this disconnect, Walker recommended that the 'future charging system should be generally based on the volume of water used and therefore on a metered system' (2009:12).[32] According to Walker, metering would help make the 'true value of water' intelligible to households by offering more information about water use patterns as well as and financial incentives to use water more efficiently (2009: 74).

Water companies undertaking compulsory water metering have played a vital role in framing the value of water in simple financial terms through their communication materials. For instance, SRN's communication strategy, which 'focused on strong branding', bore the message 'saving water saves you energy and saves you money'. Reference to money is emphasised because, according to the company, it is a core customer concern (**water company interview conducted on 12.12.2011**). On its dedicated metering website, SRN water explained that metering is desirable because 'a meter puts you in control so you can save'. Moreover, SRN argued that:

Having a meter will give you control over your household water bill and the opportunity to save money by reducing how much you use (SRN yourmeter.co.uk).

SRN characterised the meter as an incentivising tool that enables the empowered individual able to take greater control over water bills. This focus on price produces narrow, monetised, understandings of water and squeezes out other, complementary or contrasting, understandings of value.

[32] At the other end of the pipe Cave 2009 recommended, and Walker 2009 supported, market based instruments, most notably scarcity charges, to introduce an element of cost reflective pricing and competition into the abstraction license regime. At present, water is nominally priced for free and the current abstraction regime, introduced in the 1960s, does not link directly to the cost of abstraction licenses and the relative scarcity of the water source.

SEW's communications strategy differs from SRN's in that it did not hone in so closely on the price of water. SEW had intended to lead with the money saving message, it was displayed on the front page and within draft copies of its metering leaflets, however SEW's customer research revealed that the money saving message 'was not well received'. Participants concluded that this message could be construed as 'false advertising' because not all would save money with a metered charge and some households would see their bills increase (**water company interview conducted on 15.09.2011**).

Instead of focusing primarily on the cost of water, SEW focused on environmental justifications for metering. In doing so, it created the 'making every drop campaign' (see Figure 12). SEW deployed non-financial nudges, 'emotional registers', to encourage water users to be more receptive to metering and reflect on their water use (see Ereaut and Segnit, 2006; Wilkins, 2013 for more on emotional registers and Ghertner 2010 for an excellent analysis of ways of governing without numbers). Emotional registers are utilised as part of a meaning-making and a rebranding of water that represents it as something that ought to be cared for. However, this does not mean that the calculative elements were completely absent from SEW's approach, price signals remain important. Indeed, the slogan 'making every drop count' conjures financial and calculative imagery. Meanwhile interviewees revealed that SEW still expected customer to respond to financial incentives, SEW suggested that some customers might react by thinking "oh crikey this is a bit expensive; I'm going to use less water"' (**water company interview conducted on 15.09.2011**). Therefore, although SEW emphasise the value of water as a scarce environmental good, there remains a strong discursive emphasis on value in calculative economic terms.

Figure 12 Branding water metering programmes

In this context companies have placed considerable faith in households responding to the potential financial savings facilitated by metering. Through metering, companies envisaged that water would be increasingly experienced and understood as a commodity. This does not mean that the process of commodification is complete. As Bakker's (2001) work shows, water is not a "perfect" commodity. Water does 'not fit the neoclassical definition of a commodity that the proponents of market environmentalism envisioned: a standardised good or service, with interchangeable units, sold at a price determined through market exchange' (Bakker, 2005: 552, also see Page, 2005). Nonetheless, the creation of a situation where water is increasingly financialised, and experienced in commodity form, has the potential to enact major changes in how people relate to water.

Water users interviewed noted that the relationship between water and money was more explicit with metering than under previous charging methods:

*It's very clear that water = money now. It's like everything else. Before, when it was the water rates, and then a flat fee it was different, you still had to pay for it but the link wasn't so obvious (**Household interview: Nicole, SEW, 3 person household**).*

Nonetheless, at this same time, the strong meaning making relationship between metering, water and money was challenged by other interviewees who focused on other ways of valuing water, for instance as a 'precious' environmental good.

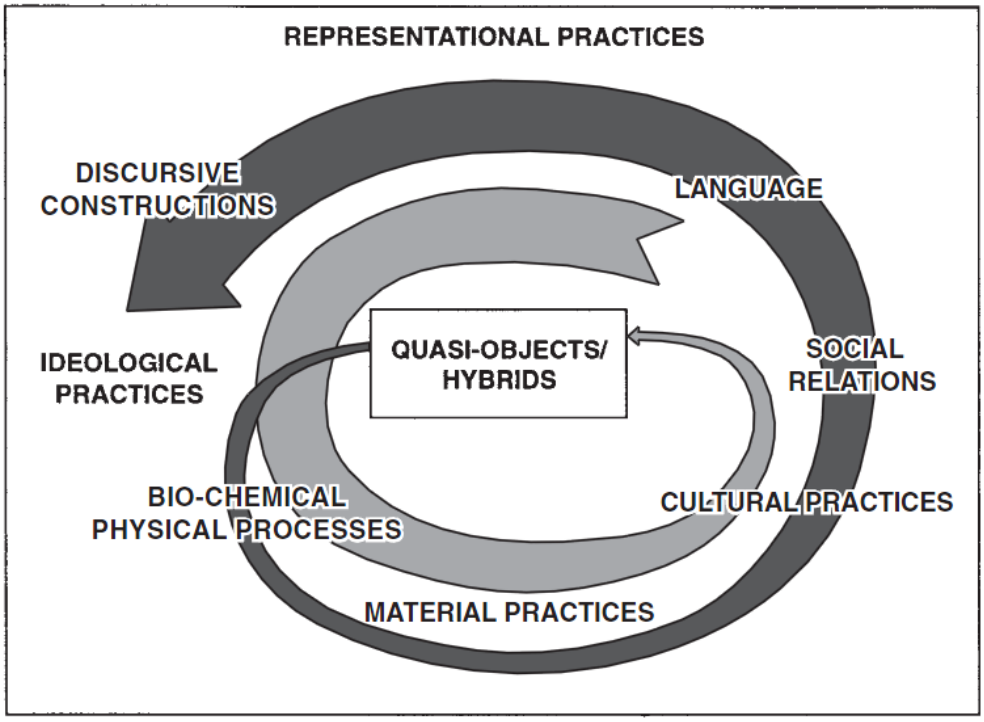
*It [the meter] doesn't force you to use less. Water doesn't always matter in terms of money, if the environment is the end goal then that's what matters. I don't think you need to pay more to do that though (**Household interview: Maxine, SEW, 2 person**).*

Although understandings of the value of water are not homogenous, the compulsory meter performs a specific role in stabilising understandings of water as a commodity and producing a waterscape that aligns more closely with neoliberal inspired pricing principles. The multiple values of water (see Strang 2004) become simplified and conflated with price. Water becomes, at least in theory, something that is always 'already encountered in commodity form' (Robertson, 2012: 386). As Robertson argues, this is important because

Buying a carbon credit is one thing; the creation of a world in which our metabolism is already legible as commodity production is another. In Marxian language, it is the difference between the employment of a worker for wages, and the creation of a society in which the worker already understands his/her labour as a commodity (Robertson, 2012: 387).

In thinking through how metering programmes have been used to produce altered understandings of relations to nature, and how this particular moment combines with others to reproduce the waterscape more broadly, Swyngedouw's (2004) diagrammatic representation of the process of producing socionatures is helpful (see Figure 13). Building on Harvey's work on moments, Swynegdouw considers the different parts that produce socionatures. In his whirling diagram he shows that 'none of the component parts is reducible to the other, yet their constitution arises from the multiple dialectical relations that swirl out from the production process itself' (2004: 20). Swyngedouw argues that, 'consequently, the parts are always implicated in the constitution of the 'thing' and are never outside the process of its making' (ibid).

Figure 13 Dialectical interaction of different moments (Swynegdouw, 2004: 20)



Water is discursively constructed in a financialised form, as a commodity, with price being the primary value of nature. In order to tackle a perceived tension between how water is valued and perceived profligate water use, companies have drawn on financial imagery, neoliberal inspired cost signals and emotive registers to reproduce understandings of the relations to nature. This understanding of the relation to nature dialectically interacts with other moments to the broader waterscape. Ideas, including nudge, are tied up in and struggled over throughout this process. For instance nudge techniques have been used to promote the 'true value' of water. This, in run, has contributed to strengthening neoliberal understandings of the waterscape.

6.7 Socialising water: Renegotiating fairness as 'paying for what you use'

The processes through which charges are constructed determines how costs of the water system are distributed amongst and between different groups of water users. The introduction of metered charging fundamentally changes the shape and form of the water charging system.

This is a key moment in relation to compulsory metering. Water companies have put forward individualistic notions of responsibility and 'fairness' in attempt to tackle a tension between profligate household water use and water stress. In this context metering has been deployed, in Foucauldian terms, as a technology of the self. Here the socialisation of water charges, together with the other moments, contributes to forming a sociotechnical fix in the water sector that broadly secures neoliberal understandings of the waterscape.

Using water meters to help negotiate different ideas of fairness is far from a new notion, as chapters four and five indicated, the use of the meter in this way can be traced throughout the last two hundred years. There is no denying that the existing method for constructing household water charges, based on rateable values, is no longer fit for purpose. The rateable value system, first introduced in 1847 to help fund sanitation improvements, was designed to be sensitive to variable abilities to pay. Historically, it had a loose correlation with income but the last domestic property rateable value assessment took place in 1973 and it is widely accepted that the rateable values used are no longer an accurate reflection of a property's value (Walker, 2009). Following privatisation, the Conservative government had initially announced that companies would no longer be able to structure charges using rateable values after 1990; it had anticipated that an alternative method of charging would emerge in its place (see chapter four). This did not occur and amendments and additions were made to the rateable charging measure in 1990. The rateable value charging system is only used for water and was perceived as a short term solution while other charging methods were developed (Bennet, 2013). As rateable values are no longer updated, the distance between property value, rateable value, income and ability to pay has become greater. As one senior water company interviewee adeptly observed, to base water charges 'on the value of your house twenty years ago is slightly crackers!' (**water company interview conducted on 15.09.2011**)

The introduction of contemporary companywide compulsory metering programmes involves a shift from collective to individual responsibility for water management. This, in turn, signals the intensification of market environmentalist principles. In this context, emphasis on individual responsibility and framings of fairness as "paying for what you use" have become key elements of water companies' nudge inspired compulsory water metering programmes. Articulating fairness in this way has the tendency to forward individualistic interpretations of social relations marked by limited notions of choice and empowerment.

Water companies undertaking compulsory water metering have successfully presented metering as an 'instrument of fairness' (Strang, 2004). Although there are some dissenting voices, overwhelmingly, actors within the water industry, consumer groups and water users appear to be united in arguing that metering is the fairest way to structure the water charging system. "Paying for what you use" has become the ultimate signifier of fairness. For instance the 2009 Walker Review Team testified that 'the overwhelming view expressed in both in the original call for evidence and responses to the interim report was that charging by volume of water used is, overall, the fairest charging system' (Walker, 2009: 68). More specifically, Walker identified eight principles of fairness. First, that charges should relate to the costs imposed on the system; charges should relate to the volume used; charges should be affordable to everyone; charges should be fair to future generations; charges should be fair to companies; charges should be simple and transparent; and the charging structure should be neither too expensive nor complex to administer (2009: 37). While these principles privilege cost recovery, neoliberal inspired approaches, the eight principles also touched on affordability and environmental objectives. At times these eight objectives look to be in competition and it is not clear how Walker anticipated that they should be reconciled. Nonetheless, cost recovery approaches and the notion of 'paying for what you use' has played a key role in rearticulating how water users are governed through compulsory water metering.

In similar terms as Walker, the EA has argued that a 'fair charging system is one based on the principle of cost reflective charges' (EA, 2009). The Fairness on Tap Coalition[33] has also argued that 'the fairest way to pay for water is to each pay for what we actually use. Doing it in this way means we don't have to pay for someone else wasting water and we are in control of our bill' (2010: 6). Most water companies agree that, in principle at least, 'ultimately metering is fairer' (**water company interview conducted on 15.09.2011**). CCW also reported that 57 per cent of respondents to its annual attitude tracking survey agree that metering is the fairest way to structure charges. Likewise, SRN argued that 70 per cent of the respondents to its customer survey 'were or would be happy to be charged for water as measured by a meter' (Southern Water, 2010). Water company interviewees suggested that

[33] Angling Trust, Association of Rivers Trust, Buglife, Chartered Institute of Water and Environmental Management, Great British Refurb, the Green Alliance, National Trust RSPB, Salmon and Trout Association, Society of British Water and Wastewater Industries, Unison, Waterwise, Wildfowl and Wetlands Trust, Wildlife Trusts , WWF-UK

paying by volume is favoured by households because this is how many other items and services are paid for, including some other utilities such as electricity. Water charging was compared with paying for food at fast food restaurants, according to one water company interviewee, water users 'always say it's [metering] the fairest way possible' because 'paying for what you use goes for everything else you do. [For example] You pay for how many McDonalds you eat, you pay by volume, and you pay by how many you have'. Furthermore, consumer organisations such as the CAB have also stated that 'paying for what you use is a reasonable starting point'. Even organisations such as AGE UK and Unison, which have been historically reticent about metering, have recently adopted metering as a preferred policy following Walker's recommendations for water metering. For instance Unison, offering a stance that differs fundamentally from its position on other public services such as healthcare, noted that while

*Some of our people would be very supportive of saying that it [water services] should be paid for by local or national taxation, the trouble with that is there is no incentive to use less or at least be more aware. The more we look into it, the more we think that metering is probably the fairest way of providing water but with the strict conditions along the lines [of] … protecting the customer (**interview conducted on 17.09.2011**).*

The fairness principle that has gained most currency, and been promoted most prolifically in water company literature, is the notion of "paying for what you use". The existing rateable charging system is depicted as encouraging 'wasteful' water use and being unfair on water conscious, or smaller, households (see Figure 14). In this context, the Fabian Society found that participants in its research 'felt strongly that if someone is using a high amount of water, it is deeply unfair for the person to pay the same as someone trying to conserve water' (Doron, 2011: 33). Here, the Fabian Society argued that 'the language of responsibility was the most appropriate term to use in describing levels of water use' (Doron, 2011:35). Furthermore, the Fabian Society concluded that '"responsibility" in the context of water use mean[t] the same thing as fairness' (ibid). The way that fairness is rearticulated as taking individual responsibility is reminiscent of Patterson and Stripple's (2010) work on governmentality and the production of responsible carbon calculating citizens as well as Maniates' (2001) work on individualism and environmental politics. With water metering specifically, fairness is likened to individual responsibility for water use and paying bills. Previously, the water charging system was informed by a sense of sharing the costs of

providing water, albeit imperfectly, across the water company area according to a series of cross-subsidies loosely based on income (see chapter seven for how companies have attempted to support those who face financial hardship as a result of metering).

Figure 14 The existing water charging system? (Waterwise in Fairness on Tap, 2010: 7)

There is valid concern that water charges based on rateable values can discriminate against single person households and the elderly who tend to use less water (although it should be noted that water companies tend to offer a single occupancy discount). However, the evidence used to substantiate the insinuation that without metering to keep the water user in check, some water users will behave selfishly by 'wasting water' is very shaky. The idea that 'paying for what you use is fair' demands greater scrutiny; the following section unpicks misleading statements surrounding paying for what you use. Meanwhile the subsequent substantive section, under the banner 'intervening in the everyday', addresses the implications that this has for how notions of freedom and control are understood following this particular interpretation of fairness.

The notion that households pay for what they use through metering is misleading. Even when metered, the bill does not reflect the 'true cost' of supply water to that household (Efra, 2012: 15). In theory, according to cost recovery principles, a customer who lives in a remote area, who is located further from the treatment works and requires the company to invest in additional infrastructure in order to supply the household, should face higher water bills to

cover the additional cost. However, these issues are not usually taken into account when bills are calculated. This is due to the principle of "de-averaging" which means that water providers are unable to cherry pick those customers who cost less to supply and ensures that

Water and sewerage customers usually pay the same prices within a given company area, even if the costs of serving those customers vary because the costs of building and maintaining the infrastructure are averaged out across the company's customer base (Efra, 2012:15).

Furthermore, according to National Audit office analysis of unmeasured bills, typically, 'only one third of the water bill pays for the operating costs of supplying drinking water and removing wastewater (Efra, 2009: 5). The remaining two thirds of the bill cover: return to debt and equity investors (30 per cent); capital charges for depreciation and infrastructure renewal (28 per cent); and business taxes (6 per cent) (ibid). With metering, water charges do not just cover what the volumetric charge, there is also a standing which normally includes at least three additional charges; a charge for removing foul water; a surface water drainage charge which covers the cost of removing and processing rain water that falls on properties and then seeps into the public drainage network; and a highway drainage charge for removing the water that falls on roads. These fixed charges are not levied equally by the different companies, the methodology for calculating these charges vary. As Walker noted

At present, different water companies set a wide range of prices for the standing charge and for the variable element. At one extreme, the average metered bill would split around 30:70 into standing charge and volumetric charges, while at the other extreme the split would be more like 10: 90… No explanation for this variation has been forthcoming from the industry or the regulator (Walker, 2009: 85).

Tables 14 demonstrates the variation between water and sewerage companies while table 15 gives a more detailed breakdown of SRN and SEW's charge.

Table 14 Percentage of average combined measured bill comprised of standard charge: water and sewerage companies

Company	Average Combined Measured Bill	Standing Charges for water and sewerage (inc Surface and highway drainage)	% of Bill comprised of standing charge
Anglian	£397	£116.00[34]	29
Dŵr Cymru	£321	£33.00[35]	10
Northumbrian (excluding Essex & Suffolk)	£295	£122.80	42
Severn Trent	£303	£102.7[36]	34
South West	£411	£74.04[37]	18
Southern	£430	£81.14	19
Thames	£324	£84.00	26
United Utilities	£362	£128.00	35
Wessex	£410	£77.00	19
Yorkshire	£304	£80.07	26

[34] This is the amount for Anglian's standard measured charge. Its other tariffs have different rates of standing charge, its SoLow scheme for low users has no standing charge and a higher volumetric charge compared to the standard, the Watersure rate has a fixed charge of £344 but no volumetric charge and its Aquacare Plus scheme has a fixed charge of £284 but a lower volumetric rate than the standard.

[35] Welsh Water do not have standing charge for sewerage. Costs for sewerage, surface water, highway drainage are calculated volumetrically.

[36] This calculation includes the surface drainage charge for a semi-detached house. Severn Trent have different charges for different property types (detached houses £91.85; semi-detached £61.28 and other £30.58)

[37] In addition to these charges, South West measured bills are comprised of a volumetric charge for surface water and highway drainage set at a rate of £3.4701 per cubic metre.

Table 15 Percentage of average metered water bill that is standard charge for SRN and SEW

Company	Service	Metered Annual Standing Charge (£)	Charge £ per cubic metre
Southern Water	Water supply	26.44	£1.169
	Wastewater	20.70	£2.198
	Surface water drainage	23.00	
	Highway drainage	11.00	
	Total standing charges	81.14	
Average Annual Water Bill			£155
Average Annual Sewerage Bill			£275
Average Annual Combined Bill			£430
Percentage of Average Annual Combined Bill that is Standing Charge			18.87
South East Water	Water supply	21.60	Ranges from 1.49 to 1.58 depending on which company is responsible for network.
	Wastewater supplied by SRN[38]	54.70[39]	£2.198
	Wastewater supplied by Thames Water	56	70.41 pence
	Total standing charges SRN/Thames	76.3 / 77.6	
Average Annual Water Bill			£169
Average Annual Sewerage Bill (SRN/Thames)			£275/£138
Average Annual Combined Bill (SRN/Thames)			£444/ 307
Percentage of Average Annual Combined Bill that is standing charge (SRN/Thames)			17.18/ 25.28

[38] As SEW is a water only company, sewerage costs are billed by other companies including SRN and Thames Therefore charges vary.
[39] This includes surface drainage and highway drainage charges.

From these tables, it can be surmised that the standing charge constitutes just under a fifth of the average water bill for SRN and SEW. Of course, actual percentages will vary from household to household. Therefore, it is clear then that households do not entirely pay for what they use and statements to the contrary are somewhat misleading. There is a limit to the amount of the bill made up by the water you use, as AGE UK highlighted

*Metering on the face of it seems fair, we're used to it with electricity and gas… [but] in some cases it [the volumetric element] has been less than, well less than 50%.... So we think it's not very clever to go on about meters to try and reduce usage without relating to actually what the bill is made of. So that's a hobby horse because we're worried that older people will try and use as little as possible without realising that it's not going to make too much difference (**interview conducted on, 07.03.2012**).*

Ofwat would prefer to see standing charges limited to reflecting the costs of providing customer related costs and therefore ensuring that the volumetric element is substantive and can then be used to incentivise water use reductions. In its 2003-04 *Tariff structure and charges* report, Ofwat stated that

To give customers sensible incentives to use water efficiently, companies should set the volumetric charge to recover the costs which they will incur over the longer term to meet demand. The standing charge, on the other hand, should recover no more than the customer-related costs for the unmeasured service, plus the additional fixed costs associated with providing a measured service (for example, meter reading) (Ofwat, 2004).

Here, Ofwat's position does not reflect an economic necessity in that

For most companies, the fixed costs in any given year incurred in running the system are about 90% of their total costs, with only around 10% of costs varying by the volume of water supplied... As a result, there are not very strong economic reasons for recovering the water industry's fixed costs in any particular way. The issues surrounding tariff design are therefore more to do with fairness of the resulting distribution of costs between different customers with different usage, usage patterns and difference in other characteristics – which might include, for example, relative need for water, relative income and so on (Walker, 2009: 85).

This section has shown that the notion that water users only pay for what they use is deceptive and companies have, through metering, rearticulated understandings of fairness to read individual responsibility. More broadly, this speaks to neoliberal trends of financialising water, individualisation and strengthening commodity relationships.

The way that tariffs are structured also reflects how water charges are socialised. Metered charges do not have be structured through a simple standing charge and fixed volumetric rate, meters can also be used in the design of alternative tariffs (Walker, 2009: 83). At present, SRN and SEW are not planning to implement different types of tariffs alongside compulsory metering and have argued that introducing new tariffs at the same time as metering would be too complicated. In contrast, Thames Water plan to install meters, conduct trials and then introduce alternative tariffs where appropriate. Meanwhile, Unison has called for a variable step tariff that has similarities with the Free Basic Water (FBW) charge in place in South Africa (Loftus, 2006; Muller, 2008; Nash, 2013 for details about the FBW). Some companies, for example Wessex Water (2012), have conducted rising block tariff trials alongside other seasonal tariff trials. Wessex found that, despite socially progressive appearances, low income families continued to face disproportionate burden under a three stage rising block tariff. These results echoed some of Loftus' (2006) conclusions with regard to the FBW water policy in South Africa. Moreover, installing water meters does not necessarily mean that charges have be structured on a volumetric basis. 'Sleeping' or 'blind' meters can be used to secure the network by identifying household leakages or monitoring water flows rather structuring charges. These different systems show that there is no one way to socialise the costs of water through water metering.

Compulsory metering programmes in the South East of England have reshaped the way water is socialised; collective responsibility, to an extent, has been supplanted by individual responsibility for managing water. Here water companies have forwarded a somewhat misleading message, that metering results in a fair charging system where households pay only for what they use. This way of socialising water is reminiscent of Pattern and Stripple's (2020) work on governmentality in that the introduction of meters encourages water users to behave responsibly and think about water in calculative terms. Taken together with other moments, this re-socialisation of water and renegotiation of fairness, contributes to a socio-

technical fix whereby companies attempt to tackle tensions within the sector, in this case the perceived unfairness of existing charging mechanisms informed by rateable value, in a way that strengthens the neoliberal character of the waterscape.

6.8 Metering, feedback and (temporal) interventions in the everyday

The reframing of fairness as responsibility is important because it legitimises particular types of interventions in everyday life. Here, I am taking a context specific, yet broad, definition of 'everyday life' to examine how people interact with and experience water. SRN and SEW's compulsory metering customer engagement programmes place great emphasis on the need to, at least temporarily, intervene in peoples' water behaviours in order to encourage households to act in a responsible manner. The approach adopted by water companies undertaking compulsory metering borrows from Thaler and Sunstein who argue that 'along with getting the prices right… we should take other nudge-like steps that can help reduce the problem in more politically palatable ways' (ibid). In particular, Thaler and Sunstein recommend 'an improvement in the process of feedback to customers through better information and disclosure' (ibid). Following the spirit of Thaler and Sunstein's nudge work, SRN and SEW's interventions took two primary forms, transitional tariffs and providing more information on consumption. These interventions in to everyday life are vital for governing others and the processes of governing how water users engage with water. Insights from social practice theory (see chapter two) suggest that these types of interventions, targeted at individual water practices, could only partially address the tension that the water industry is attempting to confront. In this sense nudge is best understood as a partial governmentality. Combined with other moments, these interventions, contributed to the sociotechnical fix by reinforcing notions of individual responsibility, freedom and choice in water management which, in turn, are central to the continuation of neoliberal waterscape.

6.8.1 Making the transition to metered charging

A shift from an unmeasured to measured water charging system will have significant financial implications for some households (see chapter seven for more on the financial implications of metering). Both companies have introduced opt in transitional tariffs to provide households with an opportunity to make adjustments to their water behaviours and limit any bill increases resulting from a metered charging system. The two companies approached transitional tariffs differently. SRN's mechanism, the Changeover Tariff,

introduced metered charges in steps over a two year time period. SRN argued that this gives households time to 'budget appropriately and review water use' (SRN, 2013b: 3). The Changeover Tariff is comprised of two elements: the measured element (what would be charged using the metered tariff) and an unmeasured element (the charge that would have been levied for the billing period if the meter had not been installed). In the first year of metering the bill paid by households who opt in to the Changeover Tariff is calculated by combining 33.3 per cent of the measured and 66.7 per cent of the unmeasured elements. In the second year, these figures are reversed so the measured element forms the dominant element of the charge. By the third year, households pay water bills according to the full metered charge (SRN, 2013b: 3). Initially SRN had proposed introducing a 'soft landing' where water users would receive an indicative metered bill but would continue to be charged on an unmeasured basis for two years. However, the CCW and Ofwat criticised this proposal because they were unconvinced that households would pay close attention to the bill and would therefore receive a sharp and sudden shock when the metered charge was finally introduced.

In contrast, SEW's Phase in Option is spread out over five periods and provides information about water use after three months. In explaining its Phase in Option, SEW provides the following example (see Table 16) where a bill increase of £20 is introduced gradually.l.

Table 16 SEW's phase in option

	Value of bill	Increase	Phrase in Option discount	Phase in Option Reduction	Payment due
1st Bill	£120	£20	100%	£20	£100
2nd Bill	£120	£20	75%	£15	£105
3rd Bill	£120	£20	50%	£10	£110
4th Bill	£120	£20	25%	£5	£115
5th Bill	£120	£20	0	0	£120

The transitional tariffs have been welcomed by regulators and, it seems, water users themselves, as a means to manage the transition to a metered charging system. However, over half of the household interviewees who answered questions about the transitional tariff in SEW's region suggested that although it might provide temporary relief, they were concerned about bill increases after the end of the transitional tariff. For example, one interviewee argued that she had little scope to reduce her household water consumption and her employment as a child-minder made matters worse:

Being a child-minder means that I have to use much more water in the home than if it was just my husband and I. Ofsted requires us to us to teach the kids how to flush the loo when they've been and how to wash their hands properly. And being kids they go umpteen times a day, sometimes 6 times each, so that's an extraordinary amount of water. It doesn't stop there either. We need to make sure we have clean towels for them to use every day and part of the remit of the job is, if they're school age, to send them to school being clean and wearing clean clothes. You can't send a kid to school dirty can you, it's not right. And if they're dirty, then their clothes are going to be. To make matters worse, some of the parents don't provide me with a spare set of clothes – so often I put those through too. So that's extra, water and electricity. I worry that having a meter will prevent me from doing my job as well as I do. For instance, kids should be allowed to get muddy and have fun when their playing. But if I can't really afford to wash their clothes, then I'm going to have to say to them to stay away from the mud, it's sad and I don't want to have to do it but I might have to. I don't really think the government or the water company understands my circumstances. I rang them up because I thought that I should be able to get some kind of discount or help with my bill because I have to use more water but they said there was nothing for me. The only thing they could do was put me on, what do they call it, a transitional tariff, but that

*doesn't solve any problems does it. It just puts them off. I'm still going to have the same problems when that tariff comes to an end (**Household interview: Janet, 2 person household, Nov 30 2011 SEW**).*

In the time between meter installation and the introduction of the full metered charge, the two water companies hope that households will be able to adjust the way they use water to mitigate any increases in water charges. In order for households to "take control" of their water bill, companies have attempted to nudge water use in less water intensive directions. As highlighted in the customer journey section above, companies have provided water savings information, free water saving technologies such as water efficient showerheads and tap aerators and free water audits. There is a general assumption within the water industry that water users' understanding of water issues is limited and, therefore, effort needs to be made to 'educate' them (EST, 2012). Organisations such as the Energy Savings Trust have advocated approaches which go beyond the usual mass letter drop. Instead, favouring personal, face to face contact with households where demonstrations of water (in)efficiency can be made and households' experiences of water and alternative practices discussed. EST maintain that this personal, tailored approach where the water user is more directly engaged is more likely to have lasting impacts on how water is used in the home. In this sense metering represents a temporal intervention in everyday life as water companies seek to give households advice and time to alter the way they use water.

Most households interviewed considered themselves to be water conscious and to have taken steps to conserve water. Table 17 outlines the type of steps that households reported that they had taken in advance, and without knowledge, of the metering programme.

Table 17 Examples of water conservation measures cited

Most frequently cited				Least frequently cited
Turning off tap when brushing teeth	Shower rather than use bath	Use paddling pool less	Installed multiple water buts	Fill up fish pond less often
Shorter showers	Installed water but	Using washing up water in garden	Turning off shower between soaping and rinsing in shower	Bucket shower
More efficient appliances and technologies (i.e. dual flush toilets)	Only using washing machine/ dishwasher when full	Wash car less often	Fixing leaks	Installing an efficient irrigation system in garden.
Wearing clothes multiples times before washing	Collect cold water from a slow heating tap (I.e. for drinking)	Use a bucket rather than hosepipe for washing car	Planting drought resistant plants	
Insert a toilet 'hippo' into the cistern		Reduce frequency of toilet flushing		
Using a bowl in the sink for washing up		Outsourcing (i.e. showering at gym/swimming pool)		

Households interviewed in SEW's service area reacted very differently to the call to alter the way they use water. Just over a third of households interviewed struggled to identify additional ways to conserve water in their home and argued that they had already made as many changes as possible without compromising comfort or cleanliness standards. These households often argued that they felt they had exhausted their options:

*I get why they're doing it and saving water is fantastic, obviously we shouldn't be wasting water but I really don't think that forcing meters on people is necessary to do that. We try to do what we can already. We don't run the water when we brush our teeth, we spend less than 5 minutes in the shower normally, we try not to run the dishwasher and washing machine unless they're full… We don't wash the car with a hosepipe or anything like that. We have an eco-bag in the loo. There's not much else that we can do (**Household interview: Karen, 2 person household, 1st Dec 2011**).*

*The information the water company handed out was okay but it didn't tell me anything I didn't already know. To be honest I can't see us using the shower timer. It takes as long as it takes to feel clean! The hippo thing isn't the most appropriate bit of kit for us, we have a dual flush loo already and that is already using a low volume of water. If they'd given us something else then we might have given that a go. At the moment I'm not sure what else to do (**Household interview: Pam, 4 person household, 2nd December 2011**).*

Comparatively, around a quarter of households stated that they would 'wait and see' whether their bill would increase before they thought seriously about any changes at home:

*We're seeing what happens, the next door neighbour has 3 daughters and he went on a meter a year ago, he's saved water so hopefully it will be the same for us too. The information that came with the meter was good and if the bill is more expensive then we'll probably follow some of the steps in there (**Household interview: Sue, 3 person household, 1st Dec 2011**).*

Others, stated that they had no plans to change the way they use water or make modifications in their home. Many of these households showed complete indifference to the advent of water metering arguing that they could do no more or could absorb the anticipated bill increase. A small proportion of these argued that that as they pay for what they use, they would use as much water as they were willing to pay for. For example, one interviewee claimed that she and her husband were 'the environment's worst nightmare' because they 'run the tap like there's no tomorrow'. Although the interviewee thought about her water use after being 'told off' by her granddaughter for leaving the tap on while brushing her teeth, she said that her husband is completely resistant to altering the way he uses water. He thinks that 'because we pay for what we use, we should be able to use it how we want'. Rather than greater conservation, individualising water use and emphasising the commodity form of water can,

for those who can afford the bill, have little effect in reducing the volume of water used at home and might actually lead to increases. This issue has also been identified through water company research where some participants told the company that because we pay for what we use, we should be able to use it how we want' (**water company interview conducted on 25.10.2011**). This irony has not been lost on the CWW, it has argued that

There was evidence to suggest that metering would put some people in the right frame of mind to be efficient with water, through financial savings. But there was also evidence to suggest that metering would put others in the wrong frame of mind allowing them to think that as they pay for it, it is therefore up to them how they use it (CCW, 2006: vi).

A smaller proportion of interviewees, just under a fifth, said that they had or were planning to reduce the volume of water used at home to mitigate any bill increases. Common examples included washing the car less and wearing clothes a greater number of times before washing. Some households interviewed, particularly those concerned about prospective bill increases, responded to compulsory metering by seeking to actively reduce their water use; this was referred to by interviewees as 'retraining'. Examples cited included using measures such as 'save a flush bag', installing a water butt, 'outsourcing' water use (for example by showering at a sports club rather than at home), capturing water run-off from slow to heat taps as well as encouraging family members to use less water, for example by taking shorter showers. Some household interviewees went as far as to mislead their family members as to when the metered charge would kick in so that they could take steps to reduce their water use prior to the receiving a metered bill. This indicates that domestic water use is negotiated between household members; it is not purely an individual practice. For instance, Nicola stated that she had

Been a bit sneaky, everyone else in the house, including my husband, thinks that we're already on a metered charge. It doesn't come on until June but I told them it's on now, so hopefully by the time we get a bill then they will have cut down their use a bit and it will be a bit easier for them to keep it up. I've put the shower timer up, otherwise they'll be in there forever. I tell them to wait it goes round and then they're out like a shot. I haven't got round to putting the hippos in but I will. I'll still water the garden now and again, I use the water from the water butt so that shouldn't be too much of a problem, it's full at the moment. I used to do the washing every day, and I could do 2 or 3 loads in one go, but now I try to do it every other day. I've tried to persuade the kids to wear things more than once before putting

*their clothes in the wash. At the moment that's as much as we are planning to do. But that depends a bit on what happens when the bill comes. If it is more, then I will try to cut down on the washing even more (**Household interview, Nicola 4 person household 1st December 2011**).*

Some interviewees found it difficult to alter everyday engagements with water, particularly surrounding bathing, and discovered that the physical infrastructure of their homes made water saving difficult due to taps taking a long time to reach the desired temperature and toilets not working well with devices designed to reduce the amount of water used for flushing. For example, on hearing that her home would receive a metered charge one interviewee hoped that she could encourage her family to adopt more frugal water behaviours to limit any bill increase. She installed a 'save a flush bag' in the toilet cistern but found that the toilet subsequently did not flush well so she removed it. She also attempted to regulate the amount of time her children spent in the shower and took more of an interest in how long taps were left running. However, her children's shower practices were much more difficult to influence than she had anticipated. The interviewee was concerned that she would not be able to minimise bill increases by reducing water consumption in her household. Consumer organizations have also questioned whether it is possible for all households to save a substantial amount of water arguing that 'there is a lot of talk about nudging customers to use less water, but there are some consumers who really just cannot change their behavior much… education is all very well up to a point but you have to accept that it is not possible in all cases' (**Consumer group interview conducted on 18.09.2011**). Attempts to exert greater agency over water use as a result of metering can therefore be frustrated by socially constructed expectations of comfort and cleanliness, which have their own histories, as well as the existing material infrastructure of the home (Hobson 2011; Strengers 2009).

Without better understanding and greater recognition of the historically and culturally specific elements that combine to configure particular practices, such as the constitution of norms surrounding frequent showering, the extent to which these types of behaviour change interventions can 'really hope to instigate large scale and sustained forms of societal change' is questionable (Jones et al, 2013: 37). Attempts to address tensions in the water sector through behavioural change seem to only offer partial solutions. Within this context Shove, and other proponents of social practice theory (including but not limited to Strengers 2009; Sofoulis, 2005; Chappells and Medd, 2008), have consistently called for practitioners to

explore ways in which *practices* can be reconfigured rather than focusing on individual water use behaviours. This would:

Entail redefining the meaning of relevant evidence such that it is about how practices develop, and not primarily about individuals' values, beliefs and choices. It would also involve reviewing policy makers' capacity to actively configure the 'landscapes' in which practices do and do not take hold (Shove, 2011: 90).

Household interviews revealed that peoples' water practices were highly diverse both within households and between households. Moreover, the way in which households use water changes over time depending, in part, on the changing composition of the household (see Pullinger et al's (2013) for a detailed study on diversity of practices). What is clear from the household interviews undertaken for this study is that attempts to intervene in everyday life and label households as 'hyper-responsible' consumers (Sofoulis 2011) or 'micro-resource managers' Strengers (2009, 2011) have been taken up by some households, ignored by others and rallied against by some. Showing that these interventions, in combination with the individualistic understandings of fairness and water as commodity, could unintentionally produce high intensity water use actions. Here, Goodwin's observation that nudge inspired interventions place 'too much emphasis on individual preferences and atomistic ways of thinking' is relevant (Goodwin, 2012: 90). These nudge inspired schemes serve as a reminder of the messy and incomplete character of policies and support the adoption of what Hobson called a 'realist', empirically informed, approach to governmentality that accommodates the nuanced people assimilate, reject and live with the emergence of new governmental rationales.

6.8.2 Nudging through feedback

SRN has taken nudging strategies a step further than transitional tariffs; it has designed new bills for the compulsory metering programme in an attempt to influence household water use. The new bill - known as the forecast bill - provides feedback on household water use and water efficiency advice. These bills also contain case studies of and comparisons with households in the local area who have made water and financial savings. Importantly, in addition to the provision of greater information, SRN plan to use the colour of the bills in order to nudge household water use. Should water users exceed the amount of water used

(beyond a particular threshold) during the previous billing period, the household will be issued with a purple bill to alert them to the higher water use. Conversely, if consumption drops below the previous billing period then a green bill is issued. SRN also have the option of altering the thresholds that trigger different colour bills. For instance it would be possible for the company to reduce the threshold during a drought in an attempt to encourage households to conserve water. In addition, SRN plan to introduce a key fob reader which can be used to provide households with real time information about water use. Here the metering programmes seek to foster, or nudge, a greater sense of household responsibility for water use and make the flows of water within the home more visible. These mechanisms are vital in the company's efforts to tackle a tension between perceived profligate water use and water stress in the South East. In this context, feedback apparatuses play an important role in the sociotechnical fix that is at work in and through compulsory water metering.

SEW did not deploy the same feedback measures in its compulsory metering programmes because the company was unconvinced that this kind of nudge would influence consumption (**Water Company interview conducted on 15.09.2011**). Consequently, SEW concluded that these types of measures would not be cost beneficial. At this time it is not clear whether these nudging techniques will successfully influencing household water use in South East England. Recent research on SRN's altered bill format suggested that household reactions to these interventions have been mixed. While some households found the additional information provided by SRN's forecast bill useful, others found the premise unclear and were disappointed that their reduced water use might not necessarily translate into a smaller water bill. CCW argued that

The 'forecast bill' provides a useful guide to water consumption for many customers who recall it. Information on bills comparing water consumption with households of various sizes is referred to but the findings suggest that this can mislead customers into thinking that if their household's use is below average, then their bill should not increase. They are unaware that if their unmetered bill was low, it is possible that they will have a higher bill when moved onto a meter even if they are using less water than average (CCW, 2013: 3).

It is too soon to ascertain what lasting impact these particular billing nudges will have on household water consumption. Nevertheless, these attempts to intervene in everyday experiences of water use demonstrate how the water sector has enacted a sociotechnical fix

through compulsory water metering. Here companies have attempted to tackle a tension in the sector, the perceived wasteful behaviour of households, by increasing information flows and providing feedback mechanisms. In this context, transition tariffs and bill related nudges have become important nudging tools or technologies of government.

This section examined how transitional tariffs and feedback mechanisms, as technologies of government, have been used in an attempt to influence water users' everyday interactions with water. The transitional tariffs offer a period of time for households to adjust to a metered charge while SRN's billing system offered a further means to nudge behaviour. In this context, these mechanisms, inspired by nudge, have emphasised individual responsibility as well as financialised understandings of water. Here water companies' have sought to tackle tensions in the water sector in ways that strengthen the neoliberal character of the waterscape. Furthermore, interventions in everyday life combined with other moments, through compulsory water metering, to contribute to this sociotechnical fix. In this context, the section showed that in examining how water users are governed, governmentality approaches are useful for teasing out how people react to nudge inspired policy proposals in different ways. This highlighted the importance of recognising that any governmentality is often incomplete and messy. Drawing on both Harvey's moments and Foucauldian notions of governmentality reveals the complex, dynamic processes through which the waterscape is renegotiated in and through compulsory water metering.

6.9 Conclusion

This chapter has argued that metering has become more than a mechanical engineering project. Companywide compulsory metering in South East England is best described as a sociotechnical fix where tensions, for example between water stress and perceived profligate household water use, have been, at least partially, addressed in a way that secures, and in some cases, strengthens the neoliberal character of the waterscape. This chapter builds on existing literature on metering by demonstrating how Harvey's work on moments, along with Foucault's notion of governmentality, can be used to explain how sociotechnical change occurs in the water sector. This chapter has shown that compulsory metering programmes are constituted of a series of 'moments' which combine to reproduce the waterscape and alter the way that water and water users are governed. The moments in question differ to those cited by Harvey and include relations of production (the RCM), technology (smarter meters), ideas

(nudge), the role of the water company and its relationship with domestic water users, relations to nature (the true value of water), socialising water (paying for what you use) and intervening in everyday interactions with water (through feedback mechanisms). Here the different moments are interrelated and evolve dynamically to reproduce the waterscape, within each moment different technologies of government are used to influence how water and water users are governed. By drawing on Foucault's concept of governmentality, as well as Harvey's method of moments, this chapter has explored how water users have reacted to the different governmental rationales offered by compulsory metering.

In the context of compulsory water metering, Thaler and Sunstein's ideas surrounding nudge have been particularly important for renegotiating the waterscape. Companies have made use of ideas from behavioural economics to communicate different understandings of the 'true value' of water and how water should be socialised. Here companies have made use of smarter technologies to intervene in and engage with peoples' experiences of water. In this sense nudge inspired compulsory water metering programmes have expressed an altered form of governmentality that depicts water as a financialised product and households as potentially profligate water users who ought to be encouraged to better understand the value of water. Here, water users are expected to respond to the greater information, financial incentives and feedback provided by smart(er) metering to use water in what is perceived to be a more responsible fashion.

The way that water and water users are governed, in and through compulsory water metering, resonates with how the water meter has been used to negotiated and renegotiate the waterscape since the Victorian era (see chapters four and five). The water industry has experienced multiple governmentalities where fairness and understandings of water have been expressed differently and struggled over. Contemporary programmes differ from previous uses of metering in terms of the governmental mechanisms that are used to reproduce the waterscape and the preference of nudging tactics over direct disciplinary mechanisms. Here the particular form of governmentality at work operates at both a policy and household scale; it influences the broader socio-economic processes as well as the micro processes of self-governing.

To varying degrees, compulsory metering has been presented as an opportunity to save money, energy and water. This, in turn, projects a sense of fairness that is rooted in limited

notions of choice, cost recovery ideas and financialised understandings of water. In this sense, water users embraced, rejected and struggled with compulsory water metering and the associated customer engagement programme. The nudge inspired governmentality that is exercised through compulsory metering is neither neat nor linear. The process of sociotechnical change is messy and throws up unanticipated outcomes, showing that governmentalities are rarely closed systems. Here Harvey's method of moments helps to elucidate the dynamic and dialectical processes through which sociotechnical change takes place. Overall this chapter argued that interventions made through compulsory metering programmes represent the emergence of a new, or at least altered, way of governing water and water users that strengthens the broadly neoliberal characteristics of the waterscape while, at the same time, addresses some of the tensions in the sector, albeit in a partial fashion.

7 Compulsory metering and water affordability: water companies as reluctant welfare providers?

*These schemes they are bringing in, these social water charges, presumably they are distinct from the general anti-social water charges?! (**Frank Dobson MP, former Shadow Secretary of State for the Environment, interview conducted on 06.03.2012**).*

7.1 Introduction

While the previous chapter explored the dynamic processes of sociotechnical change that are under way as a result of compulsory water metering in South East England. This chapter grapples with a topic that has grown in importance throughout the development of compulsory metering in South East England; the relationship between metering and affordability. As alluded to in the previous chapter, the introduction of compulsory companywide metering represents a new challenge regarding how water charges are socialised in South East England. Historically, the rateable value method of charging had offered a series of ill-targeted yet 'deliberate, selective cross-subsidies' (Bakker, 2001: 156). For instance, the rateable charging system enabled total transfers of approximately £600 million per annum, with around £180 million of this being directed towards low income households (Walker, 2009: 119). Compulsory water metering, however, entails a substantial demise of the cross-subsidies that are built into the existing charging method. If, as projected, metering penetration rates in England and Wales reach 50 per cent by 2015, then the total transfers between water bill payers will fall from £600 million to approximately £500 million a year. Moreover, as metering becomes more prevalent, the level of transfer will reduce and, in instances of universal metering, it 'will reduce to zero' (Walker, 2009: 119).

Although the social impacts of metering have come under considerable scrutiny in the global South, particularly in South Africa (see chapter two, Loftus 2006; Harvey 2005; Von Schnitzel 2008), the relationship between compulsory water metering and affordability in South East England received comparatively little attention. Questions regarding the

relationship between affordability and compulsory metering were initially deemed secondary to supply/demand balance issues and had not been thoroughly investigated. It is widely accepted that when plans for compulsory metering were originally drawn up in preparation for the 2009 price review, the two companies, SRN and SEW, were not in a position to deliver the programmes in a way that would be sensitive to affordability impacts. This is despite negative impacts on the poorest in society being frequently cited as a core reason for avoiding widespread metering since the Victorian period (see chapter four).

Overall, this chapter interrogates the discursive representations of water affordability, as a biopolitical governance problem, in England and Wales and analyses the way that compulsory metering has resulted in a renegotiation of the role of the state and the private water company. Here, it is not my intention to construct a crass binary between environmental and social debates regarding metering or to privilege the under theorised social influences of metering above all else. Indeed, as the preceding chapter suggests, such an approach would be deeply problematic. Nor does this chapter presuppose that metering necessarily produces negative effects; as discussed in chapter two metering technologies are best understood as contingent mediators that can produce both negative and positive outcomes (Marvin et al, 2011; Furlong 2013). In this context, Feenberg argues that technology can 'enframe and colonise' yet it can also 'liberate' (1999: 222). With respect to water metering, some households who previously struggled to pay their bills are likely to benefit from metering while others will struggle. Therefore, Coutard and Guy's advice to steer clear of 'intellectually and politically disabling technological pessimism' regarding the role of new technologies is apt (2007). Instead, drawing primarily on Foucault's work on governmentality and the state, this chapter teases out the messy and, to an extent, unanticipated effects of compulsory metering. It focuses on the emergence of affordability as an important and immediate governance problem that required the private water company, at the behest of the government and with support from the economic and customer regulators, to take on a new role, albeit often reluctantly, as water welfare providers.

Previous work on affordability in the water sector has analysed how the state had sought to mitigate some of the worst effects of a water charging system that privileges economic equity over social equity. For example, the former Labour government legislated against disconnection and introduced a bill capping scheme for low income households who were considered susceptible to high water charges due to a water intensive a medical condition

(Bakker, 2001). This work was undertaken at a time when companywide compulsory metering was thought to be unachievable. The introduction of compulsory metering raises different and immediate challenges with respect to affordability. In order to think through the contemporary conceptual questions regarding the implications of private water companies taking a more explicit role in providing water welfare, this chapter draws on Foucault's concept of governmentality and historical materialist work on the state to explore the process of governing affordability in the water sector. In doing so, the chapter takes forward insights from Bulkeley and Schroeder (2012) and Jessop (2007) to explore how, in reacting to the problem of affordability, new alliances, alignments and forms of delegated authority have emerged and what this means for understandings of the state.

Importantly, the private water company has been recast as an explicit, formal provider of water welfare. The chapter seeks to explain and problematize the implications of this largely unexpected extension of governing power exercised by private water companies. As chapter two demonstrates, despite some of Foucault's well known objections to 'official and vulgar Marxist' positions, there are few substantive obstacles to bringing both approaches together to address the how and why questions of governing in contemporary neoliberal regimes (Jessop, 2007: 40). The chapter argues that these two approaches help explain how water affordability (as opposed to water poverty) became a governmental problem. Here the chapter examines how the 'space of government' has been rearticulated through attempts to tackle water affordability problems emanating from compulsory metering. The chapter argues that is no simple 'roll back neoliberalism' but a stretching of the water company role. This reconfiguration of governmental relations is best thought through in relation to the current coalition government's short-lived 'Big Society' project. Here one of the main aims of the Big Society was to carve out a stronger role for the private sector in delivering services on a local basis. Although the concept of the Big Society has largely disappeared from public consciousness, at the time this research was conducted the idea of the 'Big Society' was attracting a large amount of attention in the press and in public forums. Reflecting the high volume of attention this ill-defined transient concept initially drew, interviewees from water companies explicitly referred to the Big Society to frame their new role in providing variants of water welfare. While the Big Society idea is now largely defunct, the ideological foundations that constitute it, i.e. localism, economic liberalism, volunteerism and stronger roles for the private sector (see chapter two for more detail), remain and warrant further investigation.

The chapter is divided into two main parts. The first part argues that the emergence of water affordability as an urgent governance problem is a significant yet unanticipated outcome of compulsory water metering. The second part then explores how the role of the private water company has been stretched and reshaped. It demonstrates how companies, in the context of the government's 'Big Society' rhetoric, have taken on greater responsibility for water affordability through new company-led social tariffs. The chapter shows that understandings of the state, as a series of social relations that produce governing effects, is continually contested and renegotiated over time. The chapter then explores how the renegotiation of the state contributes to shaping the type of support offered to households that potentially face financial hardship as a result of compulsory metering. Materially, the new affordability measures accompanying the compulsory metering programmes have ensured that the transition to a metered charging base is more sensitive to potential affordability problems than it would have otherwise been. However, the support on offer does little to tackle underlying affordability problems in the sector. The chapter concludes that companywide compulsory water metering has had important yet unanticipated consequences regarding the way that water affordability, as an urgent problem, is understood and managed. In devising ways to manage water affordability problems caused by metering, the role of the private water company has been reshaped and understandings of the state in respect to water governance have been reworked.

7.2 Making mischief, locating the problem: Water poverty*?*

It is a significant yet curious inconsistency that while there is an official definition of 'fuel poverty', there is no corresponding government approved definition of 'water poverty'. In fact the phrase is actively avoided within the sector. Instead the issue is framed around the less precise and contested notion of 'affordability'. The preference for the term affordability over water poverty is important and should not be taken as value neutral; the discursive difference between poverty and affordability is both deliberate and important for evaluating how the relationship between metering and affordability are made sense of. Framing in this context has important ramifications for how affordability has been understood as a particular problem that requires attention and intervention in relation to compulsory water metering. Here Foucault's iterations on discourse and governmentality are useful for evaluating how the notion of affordability, as the dominant way of framing the problem, has been made intelligible through 'processes of definition and contestation' (Raco, 2003). This is important because government is a 'problematizing activity' where the 'ideals of government are

intrinsically linked to the problems around which it circulates, [and] the ills it seeks to cure' (Rose and Miller, 2010: 279). In order to tackle a social ill, it has to be located and recognised as a 'problem'. Understanding the problem as one of 'affordability' rather than 'water poverty' translates into policy interventions that are very different.

The absence of an official, government approved definition of water poverty in England and Wales requires explanation. Interviewees suggested that the unofficial reason for preferring the absence of a definition for water poverty is that key actors within the sector are uncomfortable with depicting water poverty as a distinct social problem. According to interviewees, there is an unspoken consensus among key policy makers that water poverty is not a specific social problem distinct from general poverty. Therefore, any measures to alleviate the situation of those who struggle to pay their water bill should be addressed through the broader tax and benefits system. For example, in 2006, the House of Lords Science and Technology Committee stated that 'people suffering from serious difficulty in paying their bills should be helped through the benefits and tax credits system' (p.36). Moreover, recently, the CAB, in its response to the government's 2011 Consultation *Affordable Water*, argued that there is considerable merit in the government further supplementing peoples' incomes through the tax and benefits system so that they are better able to afford their water bill:

The simplest way to improve affordability of water would be to improve people's incomes. The fact is that many people are unable to afford their water simply because they live on a very low income and this is an issue that falls squarely within the purview of the government through the benefits and tax credit systems. The fact that benefit income fails to provide many people with sufficient income to pay their water and other essential bills leads many people inexorably towards debt (CAB, 2011:3).

In this sense, general poverty has been understood as the ill that ought to occupy government attention rather than 'water poverty' and, subsequently, government has historically provided assistance through the tax and benefits system. For example, until 1988, under the Supplementary Benefits scheme, claimants received the actual cost of water charges along with payments rent (Lister, 1995).

The approach to water is very different to that of energy. Fuel Poverty received full recognition as a *distinct* social problem in the Warm Homes and Energy Conservation Act in 2000 and the UK Fuel Poverty Strategy Act in 2001 (JRF, 2011: 2). Households were considered to be suffering from fuel poverty if they spent in excess of 10 per cent of their income to heat and power their home to a standard that is 'sufficient to maintain the health and well-being of household occupants' (JRF, 2011: 4). This definition for fuel poverty is useful because it provided a platform for government to commit to a series of strategies that target fuel poverty on a statutory basis. Such measures included a combination of targeted programmes (designed to improve the energy efficiency of homes, and therefore indirectly reduce energy bills) as well as non means tested grants for the elderly who are considered particularly at risk of energy poverty. For example, the Green Deal offers householders a loan from government to cover the upfront costs of installing energy efficiency measures; the Energy Companies Obligation (ECO) provides subsidised energy efficiency measures[40]; Cold Weather Payments provide those who are in receipt of specified income based benefits with a £25 payment for each 7 day period of very cold weather (where the temperature is either recorded as, or forecast to be, an average of zero degrees Celsius or below). Furthermore, universal (non means tested) Winter Fuel Payments of between £100 - 300 are available for people born on or before 5 January 1952 on a tax-free basis (ECC, 2013).

The Fuel Poverty agenda occupies a prominent role in policy circles, for instance the government has recently accepted a new, more challenging, relational definition of fuel poverty developed by Hills (2012).[41] Academic studies have also sought to better understand how notions of energy justice and vulnerability are 'materially configured through socio-technical networks' and everyday experiences (Hall et al, 2013: 417). In contrast to the water

[40] The Conservative government has very recently announced that rushed plans to water down the Energy Company Obligation in a myopic attempt to reduce energy bills in the short term. This could result in an average annual bill reduction of £30-35 of bills and is in response to a Labour government pledge to freeze household energy bills if they are elected in 2015 (ECC, 2013). The precise provisions and proposals made available are rapidly changing as the two political parties posture in advance of the forthcoming election.

[41] Hills (2012) determined that households are considered fuel poor if they have required fuel costs that are above the median level and were they to spend that amount they would be left with a residual income below the official poverty line. Hills concluded that the government should count the number of individuals in this position as well as the number of households they live in (p.5). This relative measure attempts to track the experience of people with low incomes living with high costs compared to those with average incomes. According to Hills, this rethinking of fuel poverty measurement has a considerable energy policy impact. Using the new measure, the number of people living with fuel poverty will only be a tenth lower than it would have been without policy interventions and the fuel poverty gap will remain roughly the same in 2016 as in 2009 (p.14).

sector, energy poverty is understood as a distinct social problem that requires government backed intervention. The acceptance of an official definition has then been translated into a programme of governance. The chasm between energy and water sectors can be explained, in part, by their respective different regulatory practices. Whereas the water sector economic regulator, Ofwat, has a pivotal role in negotiating bills by setting price limits, the energy regulator does not boast an equivalent power. Water is a much more closely regulated market than energy. From this perspective, the government expected the regulator to ensure that the water charging system remained affordable through the Price Review process.[42] Therefore, any affordability problems that did emerge were assumed to derive from broader processes of poverty and should be dealt with through the tax and benefits system.

Nonetheless, the adequacy of the tax and benefits system to cater for potential water affordability problems came under considerable scrutiny in the late 1990s due to disconnections for non-payment and well publicised increases in water bills (see chapter four). The regulator was perceived as failing to ensure the functioning of an affordable charging system and, at the same time, the available support options provided by the tax and benefits system were reducing. In particular, the ability of the benefits based system to provide for those who struggled to pay their water bills was undermined by changes made to income support in 1988 (Lister, 1995). Whereas previously the actual costs of water bills had been met directly through the benefits system, after 1988 a water charge cost of £1.65 a week was incorporated into the new income support mechanism. This amount was less than the average cost for water and, despite subsequent uprating processes, it did not increase in proportion to the price of water bills. This, in turn, eroded the purchasing power of the benefit payments (Fitch and Price, 2002: 19). The tax and benefits system was problematic in two further ways. Firstly it did not reflect the substantial regional variance in water prices and, secondly, it was difficult to assess whether the amount of benefit was sufficient because, over time, the cost of water bills was not identified separately (Walker, 2009: 120).[43] At a time

[42] In 1997 when the regulator has been thought to have been too lenient, and allowed the utility to make profits that were considered excessive, a one off 'windfall tax' has been placed on water companies. A similar call for a windfall tax on water companies was made by Robert Halfon MP in June 2013 who accused the utilities for making unreasonable profits (Hawkes, 2013).

[43] Interestingly, in its Interim Report, the Walker Review team recommended introducing regionally sensitive benefit payments to reflect differences in water prices across England and Wales. The majority of responses were supportive of this proposed measure. However, the Department for Work and Pensions rejected the idea arguing that an the introduction of a regional benefit to accommodate price differences would create additional complexity to the benefits system at time when they were seeking to simplify it through the new Universal Credit programme (Walker, 2009: 120).

when the government was taking active steps to address energy poverty, Martin Fitch and Howard Price, who were active members of PUAF, asserted the government's failure to recognise water poverty as an urgent problem smacked of negligence (2002). Here, Fitch and Price considered water poverty to be a distinct social problem that was not adequately addressed within the regulatory system and required immediate attention. [44]

Fitch and Price made attempts to compose a more methodologically sound measure of what they called water poverty that could be used, provocatively, as a platform to pressure government action to tackle water poverty (**Interview with Price, 27 March 2011**). Fitch and Price's water poverty measure was communicated through a report entitled *Water Poverty in England and Wales* (2002) (published jointly by the Centre of Utility Consumer Law, University of Leicester and the Chartered Institute of Environmental Health). In this paper Fitch and Price took 'the government's methodology for defining fuel poverty and applied it to data derived from the Office for National Statistics' Family Expenditure Survey to quantify the number of households in England and Wales deemed, on that definition, to be spending an excessive proportion of their income on water charges' (2002: 3). At that time the government considered households to be suffering from fuel poverty if they spent more than 10 per cent of their income on energy; data from the 1988 Family Expenditure Survey suggested that households in the bottom three income deciles spent 10 per cent of their income on energy (Fitch and Price, 2002: 9). Using a sample of households provided by the Severn Trent Trust Fund and the Anglian Water Trust Fund, Fitch and Price commissioned the Office of National Statistics to find out how much the lowest three income deciles spent on water (ibid). Their study concluded that these households spent on average 3 per cent. Fitch and Price then argued that this finding enabled them 'to propose the standard of 3 per cent to determine whether, in relation to their income, a household's water charges are affordable, and thus whether or not the household is experiencing water poverty' (2002: 9-10). To put this finding in context, the average expenditure on water for all water customers

[44] Although the government has not sanctioned a definition or measure of water poverty, it had previously tracked the sustainability of water charges. For example, Defra has previously used an illustrative measure of water affordability in the context of its Sustainable Development Indicators which discerned that water bills were unaffordable when households spent more than 3 per cent of income (after housing) on water. Defra came by this figure by doubling the median spend (1.5 per cent of income) on water (Defra, 2004). However, Defra did not attach specific targets or goals to this indicator and this measure was discontinued following its omission from a reconfigured list of sustainable development indicators published in 2004 (Ofwat, 2011 supporting evidence: 3).

in the UK was approximately 1 per cent. Fitch and Price concluded that, based in their calculations, around four million, or 1 in 6, households were in water poverty.

For Fitch and Price, the most important message was to highlight the reality of water poverty, to start a debate about what was reasonable for households to pay for water and to pressure government to take action. Here Fitch and Price perceived their 3 per cent figure to be 'a bit of mischief' in that it was intended as a provocative challenge to the sector; they did not intend for it to be used as a standard benchmark (**interview conducted on 27.03.2012**). Part of the problem, according to Fitch and Price, was that the regulatory system lacked a definition of water poverty that could be used to compel intervention in order to support those who struggled with their water bills (also see Sawkins and Dickie, 2006).

7.3 Managing affordability through regulation: WaterSure and the meter as a facilitator of basic needs

Concern and debate surrounding water affordability was prominent in the late 1990s. The Labour Party, which owed some of its 1997 electoral success to a campaign pledge to end water disconnections, held a water summit soon after coming into power (see chapter five). Moreover, a cross government paper was published on water affordability in 2004. This interest in water affordability did not translate into the development of an official definition or the implementation of schemes on a similar scale to the energy sector. Nonetheless, the government did acknowledge that water *affordability* was a genuine risk for a relatively small number of households.

From the late 1990s, government sought to mitigate the worst social effects of the water charging system through the water regulatory framework. Government argued that problems with water affordability could and should be dealt with through the water charging system. This did not mean completely abandoning a market orientated preference for cost recovery mechanisms, yet greater emphasis was placed on ensuring that households, particularly those at greatest risk of facing high water bills, were able to access a sufficient amount of water to satisfy essential needs. Bakker has referred to water policy charges at this time as a liberal inspired attempt to provide for basic needs (Bakker, 2001; also see Herrington 2007).

Eligibility for the main mechanism used to manage water affordability, WaterSure, was conditional upon the household accepting a water meter. Within this context, the meter acted as a facilitator of basic needs. WaterSure was introduced in 2000 under the Vulnerable Groups Regulations and capped the bill of eligible metered households at the average bill in their water company area. In order to qualify for WaterSure, households must have a meter, be in receipt of selected income-based benefits[45] and must demonstrate need by either (i) being responsible for three or more children who are in full-time education and live in the property or (ii) someone in the property having a medical condition that requires substantial additional quantities of water to be used.[46] WaterSure is a means-tested tariff and is funded through a levy placed on water customers' bills; it effectively costs £0.40 per customer bill. Recently, the government briefly entertained committing public funding to an enhanced WaterSure tariff but signalled its intention not to do so in its 2011 Water White Paper (Defra, 2011: 65).

The ability of WaterSure to address water affordability problems is limited. Take up of WaterSure is low, at present approximately 50, 000[47] people claim assistance from the WaterSure scheme and, while improving, CCW maintain that public awareness of WaterSure remains low (CCW, 2012:1). Moreover, according to CCW's and CAB's responses to the interim Walker Report, the eligibility criterion for Watersure does not encompass the full range of households who face affordability risks (CCW, 2011; CAB, 2011). In the context of WaterSure, water affordability problems have been narrowly framed and little attempt was made at monitoring the extent and effect of water affordability issues in the sector on the scale that exists in the energy sector. Indeed, there is consensus that WaterSure is insufficient to address water affordability problems. In this context, through WaterSure, the meter has played a role in tackling water affordability problems, albeit in a minimal sense.

[45] Universal Credit, Housing Benefit, Income Support, Income-based Jobseeker's Allowance, Working Tax Credit, Child Tax Credit (excluding those in receipt of the family element only), Pension Credit and Income-related Employment and Support Allowance.
[46] Examples include weeping skin diseases (i.e. Psoriasis), Crohn's disease or ulcerative colitis.
[47] At an oral evidence session at on Dec 2013 Yve Buckland, Chair of CCW, suggested that this figure has risen to 72, 000.

7.4 Managing the problem from the water companies' perspective: Governing debt

Water companies have tended not to perceive water affordability as a problem in itself but have identified water debt as a crucial problem that requires careful management. Ofwat have calculated that the level of water debt is increasing and already exceeds that of energy debt; around five million households have outstanding payments on their water bill (Ofwat, 2010b: 3). Reportedly, the 'National Debtline, a telephone helpline, have said that the number of calls it received about water debt 'had risen by 250 per cent since 2007' (Wild, 2013). The cost of recovering water debt is shared across customer bills, it is estimated that 'non-payment of bills adds about £14 [per annum] to the bills of other customers, some of who[m] may be struggling to pay their own bills' (Ofwat, 2011b: 3).[48] Water companies have sought to limit water debt rather tackle affordability problems more directly. For example, some water companies have established charitable trusts and introduced measures that are designed to provide assistance to households who face a sudden hardship and are thus unable to pay their bill or are in arrears. Historically, there has been 'little enthusiasm' for water companies taking greater responsibility through mechanisms like social tariffs for, according to an Ofwat consultation in 2000, popular consensus within the sector was that 'these are matters that should be decided by government' (Ofwat, 2000). Although affordability and debt are far from mutually exclusive, rather than attempting to tackle affordability problems, water company schemes tend to be primarily driven by companies' concerns about the cost of recovering outstanding customer debt. For example a CCW interviewee suggested that:

*It is probably fair to say that a lot of companies' approaches to affordability are very closely linked to their debt position; they tend to see them as one issue. It is understandable, from their perspective, they are not there to deliver social policy. They are there to try to collect the money from their customers. Naturally they will have a focus on debt (**Consumer Council for Water interview conducted on 18.04.2012**).*

A rather cynical attitude to debt is prominent with the water industry. It is often assumed that, rather than being unable to pay, many of those who are in debt are adopting a 'won't pay attitude'. Some companies have argued that some households simply refuse to pay their bills because they are aware that water companies are unable to disconnect households from water

[48] Tony Smith told an All Party Water Group Meeting in October 2013 that this cost has since risen to £16.

for non-payment. Companies have used this argument particularly forcefully following a recent study which revealed that debt specialists such as the CAB advise their clients to privilege debts, such as mortgage or rent payments, where there are serious implications for missed instalments such as repossession or homelessness, over water payments. Household water debtors are often represented, at best, as poor money managers and, at worst, as anti-social deviants rather than as vulnerable people who are simply unable to meet the costs of their water bill.

Of course not all households fall into debt for the same reasons and it is unlikely that all households in water debt are suffering on the same scale. Nonetheless, CCW's research, *Living with Poverty*, paints a different picture to the one composed by water companies. CCW's research undermined the notion that a 'won't pay' attitude is persistent among water users. CCW reported that:

...almost without exception, people who found themselves in arrears were not adopting a 'won't pay' attitude. Instead, they were desperately trying to meet their various financial commitments and what they wanted was a means of helping them keep their heads above water until such time that they could clear their outstanding debts (CCW, 2007: 35).

For water companies, the primary governmental problem that ought to be managed is water debt rather than water affordability. Previously, water companies disciplined payment through prepayment metering and, subsequently, companies have shown interest in flow restrictor valves for the same purpose (see chapter five). Although these technologies continue to be available in other countries, for instance South Africa and Australia, in England and Wales they are prohibited because they could result in low income users reducing their water use below that which is desirable on health grounds.[49] As a result, companies have sought to address debt through other means, predominately through a combination of charitable trusts and debt relief schemes.

[49] In relation to debt, the introduction of flow restrictor valves is periodically debated. For example as late as 2011, Ofwat noted that it was 'pleased to note that the Walker review recommended exploring this option [flow restrictors and prepayment metering] further if there is a demand from customers to help them budget effectively' (p.16). However pursuit of this option, for now, has been ruled out by the UK Government.

Auriga (2011) confirmed that seven water companies, including Thames Water and SRN, sponsor charitable trusts. As registered charities, these 'charitable trusts are run independently of the water company but according to objectives set by the donor company' (Auriga, 2011: 3). Here the donor company determines its own criteria for assistance. Charitable trusts tend to make grants to creditors rather than provide money directly to applicants; in 2000-10 approximately £16 million was made available. Where grants are made directly to the applicant, this is often done on a 'provisional basis' and applicants are 'expected or encouraged to keep up with a payment plan during a given period before receiving the award' (ibid). Charitable Trusts play an important role for households who are in debt yet the available resources are limited, for example both Auriga (2011) and Walker (2009) reported that the volume of applications can and does exceed the amount of money that is donated by the companies.

In addition to Charitable Trusts, some companies offer debt relief schemes; SRN administers a restart scheme called NewStart, whereas SEW has a programme called the Helping Hand Scheme. With the former, SRN targets customers who have debts of at least £750 and writes of debt equivalent to the value of customer payments over the course of 12 months. Meanwhile, SEW's Helping Hand programme provides financial help to clear water debt through provisional awards in cases where households 'demonstrate their commitment to improving their financial sustainability… [and] the ability and intention to pay current and future charges and avoid falling back into debt' to the company (SEW website). These schemes, targeted at households in significant debt to water companies, provide an important service in the absence of comprehensive measures to tackle broader affordability problems in the water sector. In France, where similar systems exist, such programmes are referred to as 'ex-post financial aid' (Reynaud, 2007: 19). Debt relief schemes tend to be administered on a win-win basis, meaning that they are justified to the regulator on the grounds that the cost of administering the service, and writing off customer debt, is equal or less than that of recovering debt through the court system. It is clear that water companies have taken an active role in providing measures to tackle bad debt. However, at least until very recently, there has been a reluctance to accept that there is an affordability problem in the water sector. Instead, missed payments have been attributed to sudden hardship, poor money management and, more cynically, deviant households that refuse to pay for water. Importantly, water affordability has not been designated as a specific governance problem and while the Vulnerable Groups Regulations seek to catch some of the worst effects of the charging

system, from the perspective of water companies, debt rather than water affordability has been understood as the primary governance problem.

7.5 Reframing the debate? Affordability: A new "field of intervention"

Water affordability has recently come to the fore in water policy debates as an urgent and imminent government problem that requires careful management. According to Tony Smith (2012), the Chief Executive of CCW, affordability is now a 'red light' issue for the water sector. Water affordability in this sense resembles what Rose (2007) has referred to as a new 'field of intervention'. The Walker Review (2009), undertaken in the context of impending compulsory metering, forced an important debate on the definition and discursive framing of water affordability in England and Wales. According to the CCW, although discussions around affordability had

Gained momentum in more recent years and we [CCW] have managed to get the issue up the government's agenda so it is at the stage where it is a recognised issue and it is understood that something needs to be done… it was the Walker review that gave the impetus' (Consumer Council for Water interview, 18.04.2012).

Walker concluded that the three per cent figure that had been provocatively presented by Fitch and Price in 2002 was too simplistic to capture the drivers of affordability problems in England and Wales. It concluded that

The issues surrounding the affordability of water and sewerage services are too complex to be captured in a single and somewhat arbitrary measure of a percentage of disposable household income used for their purchase (Walker, 2009: 127).

Walker argued that more work needed to be undertaken in order to better understand the dynamics of water affordability and advised that Ofwat, who have a duty to protect vulnerable households through the regulatory system, should undertake further work on the meaning and reporting of affordability issues in England and Wales. Walker implored Ofwat to be more proactive, stating that:

Ofwat already has a statutory duty to have special regard to those who are chronically sick or disabled, of pensionable age, or with low incomes. Ofwat must take its duties on affordability and vulnerable customers seriously, part of which will involve it ensuring that companies are doing all they can to minimise affordability problems. The review team believes that Ofwat should be given a clear responsibility to monitor what is happening to affordability, make adjustments to its own policies where necessary and possible, and provide outside advice to UK government and Welsh Assembly government where the action needed lies outside its responsibilities or powers. The complexity of the affordability issue and the growing impact of the transition to metered tariffs mean that as a matter of some urgency, much more needs to be understood about household income and its relationship to problems with the affordability of water and sewerage services (Walker, 2009: 128).

In response to the Walker Review, Ofwat embarked on research where it sought to develop a 'rigorous approach' to measuring water affordability (Ofwat, 2011b). Here Ofwat emphasised that, as an economic regulator, it was not its 'role to decide on an indicator or threshold that could be used to trigger help for household customers with affordability issues' (ibid). Moreover, Ofwat maintained that the matter of a threshold is a social policy decision for government. Here Ofwat argued that government should provide the appropriate legislative framework within which water companies should design and deliver company specific programmes. Company specific problems, according to Ofwat, would have the benefit of being locally accountable (Ofwat, 2011d: 4). Ofwat clearly perceives its own role, as regulator, to be limited to informing policy rather than designing or leading on social policy. In seeking to establish a workable definition of water affordability to inform government decisions, Ofwat favoured a 'basket' approach to thinking about indicators of water affordability. In a one-off study undertaken in 2011, which Ofwat has no plans to update, it developed a set of income based indicators and argued that levels of debt as well as data on self-reported affordability problems should be taken into account when identifying affordability risks.

With respect to income based indicators, Ofwat, using data from the Family Resources Survey, concluded that 'an appropriate threshold for water affordability risks lies in a 3-5 per cent range' and that 'this fulfils the requirement for statistical robustness' (Ofwat, 2011d: 18). However, Ofwat also reiterated that 'the use of these thresholds is not intended to imply

thresholds for policy interventions – only indicators' (ibid: 13). Moreover, Ofwat also stressed that it could not 'strictly describe a household paying more than 3 per cent as "having affordability problems" as this is purely an indicator' (ibid: 18). Nonetheless, using these indicative measures, Ofwat estimated that around 23 per cent (5.41 million) of households spent more than 3 per cent, while 11 per cent (2.6 million) spent more than 5 per cent, of their income on their water bills (Ofwat, 2011b:4). A more extensive breakdown of the percentage of income estimated to be spent on water is provided in Tables 18 and 19. [50]

In addition to income based indicators, self-reported data on affordability suggests that there is a problem in the water sector. For example, research commissioned by Ofwat and CCW found that 25 per cent of respondents who answered questions on affordability stated that their bills were not affordable (Ofwat/CCW, 2008). Furthermore, depending on how the question is phrased, research commissioned by Ofwat and CCW tend to find that between 15 per cent and 25 per cent of households consider their water bills to be unaffordable. Importantly, as Table 20 demonstrates, affordability risk differs between house types. The Walker Review team found that low-income households, lone parents, working age adults living alone and single pensioners are most likely to struggle with their water bills. Unsurprisingly, a research study commissioned by CCW found that a higher percentage of households in the lowest socio-economic group reported problems with meeting their water bills; 25 per cent of respondents in the DE group considered their bills to be unaffordable compared to 9 per cent in the AB bracket.

Table 18 Percentage of income spent on water bills (Source: Ofwat, 2011b: 14)

% Income spent on water	> 3	> 4	> 5	> 6	> 5	> 7	> 8	> 9	> 10
% Population	23	15	11	8	11	7	6	5	5

[50] A 2013 NAO report has since updated Ofwat's methodology and found that 12 per cent of households who spent more than 5 per cent of their income on water and sewerage bills in 2011-12.

Table 19 Proportion of households spending more than 3 per cent and 5 per cent of income, by sewerage company area (Source: Ofwat, 2011b: 14)

Sewerage company area	>3% of income	>5% of income
Anglian	23	11
Northumbrian	22	9
Severn Trent	21	9
South West	33	16
Southern	22	11
Thames	20	11
United Utilities	28	12
Welsh	30	14
Wessex	22	11
Yorkshire	22	9

Note: This table uses geographic regions indicated by sewerage company areas. These can include customers of several different water-only companies too and thus explains the difference in the figures for Thames Water and South West Water in the paragraph above the table.

Table 20 Water affordability risk by house type (Source: Ofwat, 2011b: 14)

Household Type	Spending more than 3% of income	Spending more than 5% of income	Total number of households (million)
Lone parents	42	18	1.4
Working age adults living alone	36	22	4.5
Single pensioners	36	14	3.6
Pensioner couples	16	5	2.6
Couples with children	14	7	4.4
Couples without children	13	6	4.7
Multi-unit and other	10	5	2.1
Total	23	11	23.3

The 3 and 5 per cent indicators are now used widely within the sector; in fact they are quoted in Defra's 2011 Water White Paper (Defra, 2011c: 4). However, there is no absolute consensus within the sector that the 3/5 per cent are adequate indicators. For example, Thames Water's 2010 WRMP suggested that 'in practice it might be expected that this level

would need to be higher than 3 per cent to cause actual hardship' (2010: 64). Similarly, SRN have concluded that it sees:

No obvious reason why the threshold for fuel poverty is set at 10%, yet an equivalent figure of 3% is often suggested for water. A figure of 5% for water services and 5% for sewerage services would provide equivalence with the fuel poverty definition which properly recognises that water and sewerage services remain for most customers, exceptionally good value compared with other network utilities (SRN, 2009b:10).

Moreover, CCW have argued that the '3 and 5 per cent numbers have a value in defining the relationship between income and water charges' yet, when planning the criteria for interventions designed to alleviate affordability problems, further work should be undertaken to determine whether the household is on a low income (**Consumer Council for Water interview, 18.04.2012**). Although recent work on affordability has received a mixed reception and does not readily translate into policy interventions, it is important to note that the framing of water poverty as a problem of governance has altered. The problem of affordability is portrayed as being much more extensive and complicated than it was presented in the 1990s - early 2000s. Nonetheless, the discursive framing of water affordability as an urgent and imminent concern does not entirely settle debate regarding what water affordability is and on what scale and by whom it should be managed. Instead there continues to be a struggle over whether affordability problems are particular to, and a specific result of, the water charging system or should be understood as being a component part of the broader poverty problem.

In practice, this binary positioning is unhelpful, affordability problems experienced in the sector are likely to be derived from a combination of water sector specific matters as well as broader societal issues. For instance, decisions undertaken within the water sector have a direct impact on the affordability of water bills. Water prices have increased by almost 50 per cent in real terms since privatisation in 1989 (see Table 21) and, according to the NAO, have increased by 21 per cent in real terms between 2002 and 2011 (NAO, 2013: 7). Consumer groups have argued that above interest price increases in water bills have contributed to households coming under considerable financial strain.[51] Price increases are an important

[51] The next price review is due in 2014, early indications suggest that 'most water companies have taken the regulatory and political agenda fully on board' (Utility week, 2013). Industry magazine Utility Week suggests that 'perhaps forewarned by the onslaught of outrage that energy suppliers currently face, they [water

factor, however, the impact of prices are also compounded by wider trends and circumstances outside of the immediate water sector's control. In this case, the broader relationship between household income and the cost of living is important. According to the Joseph Rowntree Foundation's (JRF) Minimum Income Standards Survey the cost of basic services and goods is increasing and, at the same time, household incomes are increasing more slowly than inflation (JRF use CPI) meaning that 'achieving a minimum standard of living' has become more difficult (Hirsch, 2013). According to Hirsch (2013), 'minimum spending requirements have risen by around 4 per cent, but wages and benefits by only 1 per cent or less'. Here the popular press and Opposition parliamentarians have referred to a 'cost of living crisis'. Similarly, the NAO found that while water bills increased by 21 percent between 2002 and 2011, median incomes were at the same level in 2011 as they were in 2002 (NAO, 2013: 7). Therefore, a combination of increasing water bills and broader of living trends is likely to account for the level of water affordability problems in England and Wales.

There is no recognition that there is an affordability problem in the water sector, yet considerable debate remains regarding how affordability should be understood and managed. Water companies, in general, continue to position water affordability as part of a broader poverty problem and argue that the government should take primary responsibility for tackling social problems. Meanwhile, the government argues that water affordability is an important problem, a solution for which should be sought primarily through the regulated water charging system. In this context, Ofwat has consistently remarked that it is for government to decide what an affordable water charging system should look and feel like while water companies should have a role in delivering solutions that are locally accountable. In this sense, water affordability as a problem continues to be presented in binary terms and, like MacFarlane and Rutherford's insights on the representation of infrastructures, is 'socially constructed by various interest groups through an array of tension, tactics and complexities' (MacFarlane and Rutherford, 2008: 370). This, in turn, has important ramifications for how the problem of water affordability is understood and governed. The way in which the 'problem' is framed is fundamentally important because it helps shape how water users are represented and how different aspects of the water sector act, according to their interests, to manage the problem in its different guises.

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companies] have been quick to announce price rises in line with or below inflation, while some have gone further, offering to forgo price increases that have already been approved by the regulator for 2014'. Not all companies will seek bills changes that are equal to or below inflation; Thames Water is the first to announce plans for above inflation bill increases.

Table 21 Water and sewerage bill change from 1989 - 2014 (Source: Adapted from Bennett et al, 2013: 9)

	1989-1990	1994-1995	2004-2005	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Anglian	350	449	418	381	444	431	435	434
Dwr Cymru	332	43	449	385	458	445	440	434
North West/United Utilities	247	316	366	361	426	406	405	406
Northumbrian	241	328	356	312	341	365	362	359
Severn Trent	238	315	339	298	340	339	337	335
South West [52]	327	527	529	490	561	563	555	499
Southern	278	342	409	345	419	436	439	449
Thames	226	283	310	281	343	345	346	354
Wessex	310	387	409	377	462	467	469	478
Yorkshire	274	332	362	327	373	366	367	368
Industry Average	251	337	363	325	370	368	375	375

7.6 Unanticipated consequences of compulsory metering: a new governance problem

The relationship between metering and affordability did not initially rank highly on the agenda when the plans for compulsory metering in the South East England were formulated. Although affordability was increasingly recognised as an important issue, the regulatory framework had not taken account of the potential affordability problems that could emerge as a direct consequence of compulsory metering. Here the development of mechanisms to manage water affordability problems emerged as an unanticipated outcome of the compulsory metering process. Focus on the messy, unanticipated development of affordability measures, to an extent, overcomes what MacKinnon has called a 'tendency to over-emphasise the coherence and effectiveness of political projects' within governmentality studies (2000: 309).

[52] Government has pledged to cut bills for all South West Water by £50 as of April 2013 for the remainder of the spending review through the vehicle of the 2012 Water Industry (Financial Assistance) Bill. Bills in the South West are approximately 43 per cent higher than the national average due to the extensive investment required to improve quality of beaches being borne by South West Water's relatively small customer base. The £50 deduction will cost the treasury about £40 million. This measure is described as a fairness issue rather than an affordability issue (**interview conducted on 18.04.2012**). Moreover, Mary Creagh MP (Labour) Shadow Environment Secretary Water has described the Industry (Financial Assistance) Bill as 'an orphan Bill which is decoupled from the long-term reforms required to tackle climate change and keep water affordable' (29 Feb 2012 col. 357).

Compulsory companywide metering represents different problems regarding affordability compared to previous metering interventions in England and Wales. Meters are not specifically targeted at low income homes with the intention of disciplining payment and water use in a draconian fashion (Drakeford, 1998). Compulsory metering applies to households on an almost universal basis and, consequently, has an enormous impact on how costs are socialised in the South East England. Most importantly, the move to a metered charging base unravels the cross-subsidies inherent within the rateable value charging system (as indicated further above). These changes do not have altogether negative consequences, indeed some households who would have struggled to meet their water costs under the previous system, particularly the elderly and households with a small number of occupants in high rateable value houses, would see bill reductions. On the other hand, larger households in low rateable value homes are more likely to experience large increases in their bills. The ability of metering to produce both negative and positive impacts for households reinforces the notion that technology, following Feenberg (1999), should be read as ambivalent, having the potential to challenge existing patterns of inequality and create different, positive and negative, outcomes.

Importantly, Ofwat's 2008-09 PR09 guidance did not explicitly require companies to perform a detailed analysis of the impact that compulsory metering would have on affordability for different types of households. Instead, the guidance was geared almost entirely around water availability (**Ofwat interview conducted on 01.10.2013**). Companies were required to conduct a cost benefit analysis for the programme as a whole, which involved justifying the cost of implementing the system and any proposed increases in the companies' price limit. Little work was undertaken on how, specifically, a transition from rateable value to volumetric charges would be experienced by domestic water users. As a result, the WRMPs submitted by SRN and SEW in advance of the 2009 price review were geared almost exclusively around the role of metering in tackling the demand/supply imbalance. For example, while SEW's WRMP acknowledged that affordability might present a concern but remained elusive as to the precise impact of its plans and what action might be deemed appropriate to manage affordability:

The Company plan has adopted universal metering. Metering remains an area of mixed customer opinion in part due to the concerns regarding vulnerable groups and affordability.

The Company will ensure it works closely with relevant stakeholders to manage these concerns (SEW, 2010: 278).

SRN and SEW's WMRPs essentially omitted any concerted assessment of the relationship between metering and affordability (CCW, 2010: 5). Furthermore, Ofwat gave its final determination on SRN's water management plan without the company appearing to be in a position to deliver the compulsory metering in a way that would be sensitive to any affordability problems arising from metering. This is despite the CCW being consulted on SRN's water management plan.

It should not have been a surprise that compulsory companywide metering would engender bill swings and, as such, would have meaningful impacts, both positive and negative, on water users. For example, Walker (2009) noted that

Metering changes the distribution of industry costs between different groups of customers and tends to increase the bills of large households and reduce the bills of small households. Although there are customers with affordability issues in both customer groups, low-income, large households will experience faster increases in their bills than most other customers. For this customer group, increased levels of metering will exacerbate any affordability problems they currently face (Walker, 2009: 116).

Research jointly commissioned by the Greater London Assembly and the EA also assessed the impact of different metering scenarios (50, 60, and 90 per cent metered) in South East England (Reid, 2009). It indicated that the speed and rate of meter penetration influenced the sector of the population at risk of water affordability problems. Reid's modelling work found that under the 50 and 60 per cent scenarios 'some households will have lower water bills and some higher bills' and,' in general, there will be more households with lower bills than higher bills' (2009: v). However, Reid also argued that the average cost increase would far exceed the average reduction that those with lower bills following metering would encounter. Reid concluded that 'only under the 90 per cent metering scenario is there evidence that water charge affordability will worsen overall', this is because 'a significant proportion of the larger households in the lower income groups would become metered, whereas under the 50 and 60 per cent scenarios these households may not be included' (Reid, 2009: v). Both Walker (2009) and Reid (2009) expected that, under near universal metering, affordability problems

would be most extensive for low-income single parents, low income households with three or more children, those with a low income and a high essential water use for medical reasons, low income households in high cost areas and those with a low income more generally (Walker, 2009: 188; Reid, 2009). In this context, Walker recommended that measures to tackle affordability problems should be developed *in advance* of compulsory metering interventions.

Nonetheless, according to a consumer group interviewee, 'despite a clear message in Walker that affordability needs to be addressed before metering goes any further; that does not seem to have been taken any notice of' (**consumer group interview, 27.03.2011**). The initial omission on the relationship between affordability and compulsory metering points to a significant problem in the regulatory system; that the PR09 process did not require companies to thoroughly consider the affordability impact on metering. Focus fell disproportionately on water resource issues associated with metering. Affordability issues, as a specific governance problem particular to metering that needed to be managed, were initially unanticipated by companies as well as regulators and some consumer groups. The potential of compulsory metering to exacerbate, and even create, affordability problems came to the fore through the public inquiry launched to investigate SEW's WRMP.

SEW's 2010 - 2035 (as well as Thames Water's) WRMP was subjected to public inquiry. Water companies' statutory WRMPs are subjected to public inquiry, on the behest of Defra, in cases where the companies' plans are deemed controversial and disagreement between companies and Ofwat cannot be reconciled through the regular price review process. The terms of reference for SEW's WRMP primarily reflected concerns that the company had not adequately considered a full range of options in its forward plan, had used unjustifiably high PCC assumptions and that its plans were not sufficiently cost effective or environmentally sensitive (Boyland, 2010: 2). Nevertheless, the CCW used the public inquiry as a platform for demanding that the 'largely unexamined and unaccounted for distributional and affordability impacts' of the imminent compulsory metering programmes be taken seriously and thoroughly investigated (CCW, 2010a: 5). CCW highlighted that affordability and other aspects of metering should not be divorced from one another (see chapter five for more on the dialectical processes of socio-technical change). In its submission to the public inquiry, CCW argued that 'an inquiry and report which omitted any assessment of affordability and

distributional aspects [of companywide compulsory metering] would be incomplete' (CCW, 2010a:5). CCW stressed that

The fact that some WRMPs with significant metering programmes have been approved despite the present state of uncertainty about the distributional impacts and potential mitigation options is no reason for neglecting the affordability impacts at SEW's WRMP Inquiry. We suggest that affordability is an admissible consideration both because the purpose of the inquiry is to investigate all the concerns expressed about the WRMP, and because affordability is an important aspect of any change in the way households pay for water and sewerage services. We go further and say that excluding affordability issues would put the Secretary of State at risk of neglecting his duty to have due regard to the needs of households on low incomes. It follows that he should have available analysis and advice on such impacts before making decisions, and that an assessment of the affordability impacts of recommended metering policies without mitigation measures should be part of the Inspector's report (CCW, 2010a: 4).

The inquiry process brought about a substantial shift in how metering programmes are approached and what 'problems' are deemed important in the planning phase. As a Thames Water interviewee highlighted, ways of thinking about metering have changed in the water sector. Rather than being limited to water resource issues associated with metering, 'the wider debate has focused on the actual effect on people' (**water company interview conducted on 31.10.2011**). Potential affordability problems caused by companywide compulsory metering programmes emerged as a serious problem that needed to be managed and mitigated in order to secure the successful implementation of metering programmes. Subsequently, the key question became: how should water affordability be governed and who should take responsibility for designing and delivering such mechanisms? The answer to this question has substantial ramifications for understanding the role of the state in governing the waterscape.

7.7 How to manage water affordability? The "Big Society" in action

The government has made clear that it expects private water companies to provide mechanisms to support those who struggle to pay their bills. Companies are expected to proactively manage affordability problems in the water sector in addition to dealing with bad

debt. In this context, the role of the private water company has been stretched to encompass explicit responsibilities for providing water welfare services to manage water affordability problems caused by metering. In thinking through this reconstitution of relations, Foucault's work on the governmental state, where he explored 'the continual (re)definition of state competences and the division between public and private', is instructive (Jessop, 2007: 38). As Bulkeley and Schroeder (2011) suggest, the boundaries between state and non-state and public versus private are not easily drawn and undergo continual processes of contestation where new alignments are forged. In South East England, the assemblage of practices, and strategies that comprise the state are reorganised in ways that both extend and curb neoliberal, market environmentalist, approaches to managing the waterscape. More precisely, metering, on the one hand, extends neoliberal commodification and instils cost recovery approaches yet, at the same time, companies have sought to protect those most exposed to affordability problems through specially designed support tariffs. This reorganisation is best understood in the context of the Conservative Party's short-lived Big Society concept and the party's broader ambition to deepen the role of the private sector in delivering services.

The Conservative Party's fleeting Big Society project sought to strike a different 'balance between central state and civil society in favour of the latter' (North, 2012: 820). Within this context localism and deregulation became key watchwords (Featherstone et al, 2012). The Conservative Party claimed that it was 'not opposed to the state but deeply concerned about the state's ability to meet social needs' (North, 2012: 818). Crucially, proponents of the Big Society placed considerable emphasis on the role of the private sector (as well as individuals and families) in meeting needs that are often thought to be safeguarded by government. In this context, the Big Society idea privileges 'accountability to local communities', in this case households within a water company area, over accountability to a democratic body. The government has encouraged water companies to take a proactive role in designing and delivering affordability programmes to mitigate the negative impacts of metering. It advised that

Any undertaker that chooses to introduce a universal metering programme across all or part of its operating area, or where metering reaches very high levels, should seriously consider including a company social tariff in its charging scheme. This would address long-term affordability issues that may arise from the unwinding of the cross-subsidy inherent in charging for water according to the rateable value of a property (Defra, 2012b: 6).

This does not mean that government completely disappears, it retains a role in setting the broad policy framework and the legislative conditions for the water industry. Nevertheless, water companies have undeniably been granted greater responsibility for water welfare provision. In this sense, the government has been quite clear regarding how it understands this reworked relationship, it stated that

The government has responsibility for setting the policy and legislative framework for addressing social issues, including water affordability. The government wants to see water and sewerage undertakers take a more proactive role in responding to the needs of their customers including by developing and implementing local solutions to local problems (Defra, 2012b:2).

The government introduced the 2010 *Flood and Management Act*, in part, to facilitate the water companies' new, more expansive role. Section 44 of 2010 Act contained a provision that enables, yet does not compel, water companies to introduce a social tariff. Prior to this legislative move, companies had been prohibited from introducing any tariff that would result in cross-subsidies between different categories of customer. Ofwat made an assessment that water companies should not be expected to provide measures beyond the Vulnerable Groups Regulations (Herrington, 2007). This was in part due to the perverse way that License Condition E of Ofwat's charging principles, which stipulates that 'companies must make sure when fixing their charges that no undue preference is shown to, and that there is no undue discrimination against, any class of customers or potential customers', has been interpreted. Measures that involved transfers between customers were interpreted as potentially discriminating against some low income customers in favour of others (Ofwat, 2012b). The government's decision to allow, but not compel, companies to introduce social tariffs has resulted in the official Opposition describing the situation as 'the Big Society in action' (Mary Creagh MP, former Shadow Environment Secretary, House of Commons, 2012). This claim implies that the role of the state in managing the waterscape in South East England is being reconstituted and companies, acting on a voluntary basis, are expected to provide a water welfare service.

Companies have responded to their new role, and the government's position on social tariffs, in different ways and with differing degrees of zeal. In a broad sense, Walker (2009) remarked that there was a strong feeling across the sector that social policy was a matter for

government. Indeed, the issue of who should be responsible for designing, funding and administering water welfare through social tariffs continues to be a 'sticking point' within the water sector (**Water company interview conducted on 15.09.2011**). Some companies have welcomed the responsibility[53] while others have been much more reticent. Interviewees attributed this variation to different water company cultures, ownership structures and conflicting priorities within water companies. An interview with the CCW highlighted the different water companies' approaches regarding affordability and the development of social tariffs. CCW noted that

*There are some companies that are keen to get started and those who are keeping a watching brief before committing to anything. I think it generally falls into three camps. Those who don't intend to do anything, those who are keen to get on with it as soon as the opportunity presents itself and those who are keeping a watchful eye (**Consumer Council for Water interview 18.04.2012**).*

Although, some companies have supported the notion that companies should proactively provide mechanisms for those who are unable to pay their water bills, the companies undertaking companywide compulsory metering have demonstrated a degree of reluctance. Unsurprisingly, SRN and SEW argued that the government should be the primary actor in delivering water welfare. For instance, in its Final Business Plan SRN stated that:

We believe that it is right that water companies should take reasonable steps to address the worst affordability issues. Ultimately, however, issues of social equity must be a question for elected politicians, not private business or regulators (SRN, 2009b: 15).

[53] Although not administering companywide compulsory metering, Anglian Water and Wessex Water have proactively offered forms of social tariffs. Anglian offers a scheme called Aqua Care Plus which is targeted at low income households who have a meter and are in receipt of benefits from a specified list. The tariff has a higher than standard fixed annual standing charge but charges less for the volume of water used. Wessex Water offer a scheme, Water Assist, where a Citizen's Advice Bureau or debt advice agency must apply for the tariff on behalf of the household. Households then pay a lower bill bases on their ability to pay (Wessex Water, 2013). Currently around 8, 000 customers receive support through this route. Ofwat have permitted this tariff because Wessex Water have demonstrated that it is cost neutral in that it costs as much to administer as it would to retrieve outstanding charges through the court system. Thames Water has indicated that it will introduce a social tariff in 2014 that is not directly related to metering. SRN also intend to administer a social tariff 'as soon as possible' after 2015, although the details are not yet available.

Furthermore, SEW suggested that encouraging the company to take on additional responsibilities for providing social tariffs challenged the accepted role of the private water company. One senior SEW employee noted that:

*You could take the view that companies have a social responsibility in the "Big Society" framework. That we, as a company, should be looking at the local community and seeing what their needs are. But you can take the other view that we are a service provider, largely, and it seems a bit odd that we might be asked to do that. That is the way it is going to be and we are just going to have to get on and deal with that. Our view as a company is that we should not be doing that but if you are mandated, you have got to do it. It shouldn't be our role (**Water company interview conducted on 15.09.2011**).*

The repositioning of the private water company as a reluctant welfare provider within the Big Society represents a significant reshaping and reorganisation of the 'the state' in the South East of England. Water companies have the opportunity to, with those undertaking compulsory metering being expected to, provide explicit forms of water welfare. In this sense, the introduction of compulsory metering has produced an unintended outcome; the renegotiation of the way that the waterscape is governed. The unexpected nature of this change is reflected in Ofwat's decision to adjust both SRN and SEW's price agreements. This allowed the companies to fund mechanisms that could analyse and tackle any hardship resulting from compulsory metering. The remainder of this chapter is devoted to exploring the governmental rationales, techniques and strategies employed by companies who, in performing their new roles as reluctant welfare providers, seek to manage water affordability problems caused by compulsory metering programmes.

7.8 Affordability as a local problem?

One of the main reasons for repositioning water companies as welfare providers is that water affordability has been portrayed as a *local* issue with distinct characteristics according to particular water company areas. In line with the Big Society mantra, which emphasises local accountability over democratic responsibility, individual water companies have been considered best placed to manage water affordability problems. Water companies undertaking compulsory metering were required by Ofwat's October 2010 guidance to produce a 'winners and losers analysis' in order to better understand the changing

affordability dynamics brought about by the unwinding of the rateable value system in their area (SEW, draft strategy, personal correspondence). In this context, companies have undertaken economic modelling which, in turn, has helped them better understand and govern water affordability. In this sense, modelling operates as a governmental technology that reinforces the notion that affordability is a local problem best managed by companies on an individual basis.

Government is certainly convinced that water affordability risks are substantively different across, and are particular to, specific water company areas. For instance, the government's guidance regarding social tariffs stated that:

The government is clear that undertakers are best placed to take decisions around the design of company social tariffs as part of their charging schemes so that they can take account of local circumstances, needs and the views of their customers (Defra, 2012: 1).

Furthermore, regarding mechanisms for managing affordability, the government argued that 'national consistency is neither feasible nor necessarily desirable' (Defra, 2012: 4). While it is certainly true that the gross number of households experiencing water affordability problems differs in the various water company areas, it is highly questionable as to whether the type of household facing affordability risks does.

Although the information is reported in a way that makes comparisons difficult, SEW, SRN and Thames Water have all produced similar findings regarding the impact of metering on affordability. SEW found that, overall, more water bills would be higher (56 per cent) than lower (44 per cent) (see table 22 for distribution).[54] The companies' analysis reveals that while 'a significant proportion of lower income customers will benefit from being metered… within that low income loser group there are some significant bill increases' that are in excess of £200 (Table 23). Here 'households with 2 or more working age adults with no children and families with up to 2 children' were found to be particularly at risk of affordability problems.

[54] Although the number of 'losers' varies depending on which company water users receive their sewerage services from.

Table 22 SEW AMP 5 Water supply winners and losers (excluding optants)

Bill change	>£60 Higher	£40-60 Higher	£20-40 Higher	Up to £20 Higher	Up to £20 Lower	£20-40 Lower	£40-60 Lower	>£60 Lower
000's customer	56.1	13.7	12.3	16.5	16.3	13.7	10.0	10.5

Table 23 SEW Water supply winners and losers by income (000's customers)

	>£200 Higher	£150-£200 Higher	£125-£150 Higher	£100-125 Higher	£80-£100 Higher	£60-80 Higher
Bottom 30% Incomes	4.2	1.9	1.4	2.7	0.9	0.5
Middle 40% Incomes	1.6	3.6	3.1	2.9	4.0	4.1
Top 30% of Incomes	0.4	6.9	5.8	4.6	3.7	3.8

Similarly, SRN initially reported that approximately half of the households receiving meters as part of its Universal Metering Programme will see an increase in their water bills while the remainder will see a saving (Simmons, 2012). In its 2009 Final Business Plan, SRN reported results from indicative modelling undertaken by ICS Consulting which showed that around 60 per cent of households would experience small bill changes (+/- £5), while some, particularly low income families, would see rapid increases in their bills. More recently, Darren Bentham (SRN's Director of Metering) reportedly told a local newspaper, the Argus, that:

Of those households that have received bills as part of the programme around 59% are enjoying a reduction in their bills. Average savings are £11 a month, with some families saving nearly £100 a month due to the new, fairer system of charging by meters. Around 41% of customers have experienced an increase in bills (Bentham in the Argus, 2012).

While almost 60 per cent of SRN's metered customers have seen a reduction in their bills, CCW's recent research on *The Customer Impact of Universal Metering Programmes* revealed that other households have experienced much greater bill increases than average. For instance, CCW found that a family of four were expecting their bill to rise from £500 to £700 based on their forecast bill (CCW, 2013: 53). CCW observed that

Once the first bills were received, while it was mainly family households that saw an increase, it seemed not to be confined to these. Moreover, some of the smaller families who lived in properties with a lower rateable value were surprised at the increase especially as they sometimes felt they had been led to believe that all customers could save by going onto metered charging (CCW, 2013: 54).

Meanwhile Thames Water, using a bespoke geo-database, designed specifically to support their metering plans, called Customer Analysis and Rollout Design (CustARD), modelled the influence its metering programme would have on its customers' bills. With findings similar to those of SEW and SRN, it suggested that the bill impact would be, broadly, normally distributed with many households experiencing relatively small bill changes of +/- £10-£20 while some households would potentially face significant bill increases of over £100 a year as a result of a metered charge.

The findings across the three water companies suggest that the absolute numbers of households likely to experience affordability problems as a result of a large increase in their water bill following metering varies. Nonetheless, there are similarities regarding the type of household likely to be at higher risk of facing affordability problems. Therefore, it seems unlikely that the character of affordability is locally specific and substantially different across water company areas. Consequently, the value of enabling each water company to design and introduce affordability measures on an ad hoc basis is questionable. The CAB have come to a similar conclusion, noting that

Although it is argued that water companies have particular insights into the affordability needs of their customers, we are not convinced that this means companies need to have absolute control over the design of their social tariffs. Our debt statistics indicate a consistent pattern in the age and household profile of people who need help with water debt across the country. While water debt and water affordability are not perfectly correlated, we believe our evidence does suggest that certain groups of people are consistently more likely to get into difficulty with paying for their water (CAB, 2012: 3).

While the government, and elements of the water industry, have distanced themselves from national affordability solutions, trends in the energy sector are now pointing towards a more coordinated, national, approach.[55] Although mechanisms have been offered to better manage the transition to a metered charging system, there is no guarantee that social tariffs will be introduced for those who struggle to pay their bills but live in an area where compulsory metering is not under way. For example, the CAB and CCW have expressed concern that the voluntary nature of social tariffs might lead to different service levels being made available across England and Wales. Instead, the CAB have advocated 'introducing some form of standardisation in social tariffs' with an element of flexibility in design (ibid). Interviewees from the CCW raised concerns about the consistency of companies' affordability mechanisms, and highlighted that

*A company may decide that they are not willing to go down that route [providing a social tariff] or customers might say for whatever reason that they are not willing to pay anything. So you will different levels of support in different areas… And you have the comparisons with energy where you had the more localised social tariffs but now they are moving towards more nationalised schemes (**Consumer group interview conducted on 18 April 2012**).*

In this context, Julie Hilling MP has called for national action on social tariffs, arguing that her region in the North West, served by United Utilities, would not benefit from company social tariffs and that, as private monopolies, 'frankly it is not enough just to expect them [water companies] to be philanthropists' (HC debate, 6 Match 2012: c720). She described the

[55] The Walker Report did actually recommend a range of affordability interventions for the Government to consider that are more analogous to the energy sector. It suggested that low income households should be assisted through a discounted volumetric tariff where 'all low-income metered and assessed charge households in receipt of certain mean-tested benefits and tax credits should be eligible for a 20 per cent discount on their bills' (Walker, 2009: 123). Or, alternatively, by means of a discounted volumetric tariff targeted at low income metered households with children who were in receipt of specified means-tested benefits or tax credits. This second tariff would offer a discounted water bill equivalent to, following WHO guidelines on minimal water requirements, 50 litres per day per child. Walker estimated that this would cost around £40-80 per child and would provide 'each child with a daily amount of water to ensure essential needs are met and deliver a lower bill for the household while still retaining an incentive for water issuing' (Walker, 2009: 124). In addition to these three proposals, Walker recommended the introduction of company specific water efficiency schemes for low income households. Such a scheme would include the retrofitting of water efficiency measures as well as interventions to address 'more general affordability issues such as benefit entitlement checks' which, Walker argued, 'have been shown to provide additional income for many households' (Walker, 2009: 125).

situation (in rather clichéd terms) as a 'postcode lottery for millions of customers facing water poverty' (HC Debate, 29 Feb 2012: col 360). Moreover, the Shadow Environment Secretary, Maria Eagles MP, has remarked that it was difficult to see how allowing water companies to implement social tariffs on a voluntary basis would ensure that customers receive consistent support. More recently, Eagles announced that the Labour Party 'will seek to use the forthcoming Water Bill legislation to require all water companies to participate in a national affordability scheme' (Eagles, 2013). The waterscape could, therefore, look significantly different if the Opposition are successful in pursuing this amendment.

The construction of affordability as a local problem contributes to water companies being reconstituted as water welfare providers. Companies have been portrayed as best placed to identify problems and solutions regarding their respective constituencies. This devolution of responsibility for managing water affordability by extending the role of the private sector into new aspects of the water charging system, has profound implications for the design and scale of schemes that have been developed to tackle water affordability problems resulting from metering.

7.9 (Partially) paying for water affordability

The decision to allow each water company to design its own water affordability mechanism is not politically innocent, in advocating company by company approach the government has found a means to address water poverty without negatively effecting its own balance sheet. In this context, the CCW have noted difficulty in 'gaining government acceptance to take bigger ownership to address the problem and to fund that through public expenditure' represents (**Consumer Group interview conducted on 18.04.2012**). This, according to the CCW, is 'one of the most important barriers' to developing appropriate affordability measures (ibid). The government's reluctance to commit public funds is particularly acute following the 2009 financial crisis. Interviewees suggested that 'in the current climate they would obviously prefer the companies to have the ownership' over funding affordability mechanisms (**Consumer Group interview conducted on 18.04.2012**). Funding for affordability measures, then, is derived through transfers between households (levied through water bills) within a water company area rather than through public funds raised through national tax receipts. Critics of the government's approach, have questioned whether sufficient funding

can be raised through customer transfers to adequately tackle affordability problems in the water sector.

The Defra (2012b) guidance on company social tariffs requires that companies considering such a tariff consult CCW and Ofwat, as well as its customers, regarding how much households would be willing to contribute to a social tariff from their own bills. In this context, the Chief Executive of CCW told the Environment and Rural Affairs Select Committee that while affordability apparatuses such as social tariffs would help tackle affordability, it is unlikely that these mechanisms would raise sufficient funds to adequately tackle the problem (Efra, 2012). Research commissioned by CCW concluded that water users' would prefer a national, government funded, solution but also found that 'most participants were willing to make some contribution via their bills providing the total amount was affordable – for most people, this was less than £5' (CCW, 2010d: 16). The report warned that the figure of five pounds should not be taken too literally and cautioned that participants tended to favour a level of cross - subsidy lower than £5. On this issue, the government has advised that

A charge of up to 1.5 per cent of the average annual household water and sewerage bill across England would be a reasonable amount of cross-subsidy to expect non-qualifying households to provide under a company social tariff. This figure is offered as a broad indicator rather than a cap. The key test is that the proposed level of cross-subsidy should have broad customer acceptability (Defra, 2012b: 8).

This indicative threshold would translate to around £5 based on the average 2011/12 bill (Defra, 2012b: 8). CCW has questioned whether a social tariff funded through household water bills could simultaneously raise enough capital and prove acceptable to households whereas CAB (2012) expressed disappointment that the government prescribed a maximum but not a minimal level of support for social tariffs. It has not been possible to find out how much SEW and SRN's support tariffs cost, only the overall cost of the metering programme (£100m over ten years and £83m over five years respectively). However, Snell and Bradshaw (2009) and Walker (2009) both assessed the amount of funds needed for a range of potential water affordability measures on a national scale and, according to CCW, found that a 'comprehensive affordability solution could be in the region of £400m' yearly (Efra, 2012).

This amount is far in excess of the amount that would be raised through bills; Tony Smith has stated that

Customers might be prepared to contribute up to perhaps £2 extra from their annual bills but not much more, to help others on low incomes. Customers funding at that level would generate around £40 million across the industry.

Whether it is through general taxation or water charges, waters users will foot the bill for affordability measures. Many stakeholders in the water sector, and in fact most households, favour national funding of social tariffs through taxpayer receipts. Funding social tariffs through national taxation would be more progressive for two reasons. Firstly, contributions taken through income tax would be more closely aligned to ability to pay. And, secondly, national funding would avoid potential funding difficulties in areas where a large amount of water users struggle to meet the cost of their bills.[56] Under arrangements where a social tariff, or another affordability mechanism, has been funded through water company bills on a local basis, some companies may find difficulty in setting a levy at a level that would satisfy funding requirements without causing additional affordability problems for households that are currently just above the threshold. Government support for water company led affordability measures is linked to localism and Big Society style politics, yet it is also has financial benefits for companies bear the cost and, in turn, pass the cost on to their customers. Fundamentally, while the production of company affordability mechanisms and tariffs ensured that the transition to metering has been more sensitive to affordability issues, the funding mechanism that has been preferred may not be sufficient to meet the cost of tackling the problem of affordability comprehensively.

[56] Interestingly, the current government have recently announced that it plans change the funding arrangements for some of the social and environmental programmes that are currently funded through consumer bills. In response to pressure regarding the rising cost of living and increases in energy bills, the government has announced that it will, in the short term, fund a rebate on energy bills and the Warm Homes discount through revenue recovered from tax avoidance. In the future, these programmes will be funded through general taxation (DECC, 2013). No corresponding announcement has been made regarding water bills.

7.10 Reconfiguring accountability: Owning the relationship between customer and provider

In addition to taking the cost of providing water welfare off the balance sheet, company led approaches to water affordability have helped reconfigure processes of accountability for social policy. Each company, in line with Big Society inspired localism and effectively acting as a social policy agent, is required to devise criteria for its water affordability mechanism. Here the government has been reluctant to act in any way that could be interpreted as prescriptive. For example, it has not stipulated a minimum standard, or detailed guidance, regarding eligibility criteria (Defra, 2012b: 3). Consequently, accountability for water welfare predominately lies with the private utility rather than with government. In this sense, company social tariffs have been referred to, affectionately, as 'DIY affordability solutions' in the sector press (Utility Week, 2011). Here the government have sought to ensure that the 'water companies own the relationship with customers' (**Ofwat interview conducted on 01.10.2013**). The relationship between the state and private water utilities has been reworked with important ramifications regarding how accountability is articulated; a private organisation rather than a democratic body has become responsible for deciding who should be eligible for help with their water bills. The ability of private water companies to define their own eligibility criteria is important because it provides insights into how power and authority are continually redistributed and renegotiated in the practice of governing in the water sector.

Encouraging water companies to develop water affordability criteria is not without its problems. Water companies do not have extensive experience developing social policy and there are questions regarding the legitimacy of a private organisation deciding who should be eligible for help with their water bills. In developing affordability mechanisms, some water companies had expected to work closely with the Department for Work and Pensions (DWP) and had anticipated that benefits entitlements could be used as key eligibility indicators for affordability mechanisms. According to the CCW, this would have been advantageous in that it 'increases the perceived legitimacy' of the schemes because 'you are linking up to an accepted way of determining eligibility rather than making value judgements about peoples' personal circumstances' (**CCW interview conducted on 18.04.2012**). Moreover, some water companies have expressed unease regarding the difficulty and desirability of their new task. For example, SEW reflected on the some of the problems with its new role, stating that

*We were saying that effectively that should not be up to us [to design a social tariff], that it is definitely a government role. We are a privately owned company that is about making a return. Okay, we have a public health responsibility but we are not another element of the social services. We were of the view that it should be quite straightforward for DWP to send us a list of people on benefits and then we could send them an appropriate bill. However, there is a whole data protection problem around that and so it all gets very complicated. If you read the Walker Report which was about future charging, there is a lot in there about how that could work and it basically concludes that it is quite knotty. Defra are effectively going to put the Walker Review into action in the White Paper that is coming later in the year, they are going to leave it up to companies, I can guarantee that, that is basically because it falls into the too difficult box! (**Water company interview conducted on 15.09.2011**).*

Benefit entitlements have not been used to shape water affordability mechanisms for two reasons. The primary reason is that data protection issues prevented the DWP from sharing information regarding benefits recipients with water companies. The second reason is that there are questions concerning how well eligibility for benefits and risk factors shaping water affordability problems are correlated. Consequently, water companies have developed their own ways of assessing need. For instance, SRN commissioned work from Experian to identify households that could face bill increases, SRN were interested in reaching households on low incomes, especially those not in receipt of benefits but would receive much higher bills. Interestingly, SEW claimed that their own research suggested customers perceived private companies to be better equipped to assess need than government:

*It is quite interesting… we asked them if we should have different tariffs for people on benefits, their answer was not unexpected but they think that those in genuine need should get something but if you said, we are planning on linking that to the benefits system then no no no no because they think that the wrong people get benefits… So if we were giving to people on benefits we would be seen as compounding that problem! So bizarrely enough they effectively led us down the route, they trusted us more to do an assessment of need through a social tariff than they did the government's benefits system (**water company interview conducted on 15.09.2011**).*

Despite the government's conviction that companies are best placed to understand customers' needs, and the companies' suggestion that water users perceive companies as more legitimate welfare designers than the government, other actors within the sector have expressed concern about the lack of uniformity, and the dearth of explicit guidance provided by government, regarding the design of affordability mechanisms. For example, the CAB raised concerns about the amount of discretion water companies have been afforded. In its response to the government's 2012 guidance on social tariffs it stated that

We are disappointed with the way in which Defra has chosen to implement social tariffs in the water industry. We feel that the draft guidance is lacking in detail and is insufficiently prescriptive. We are concerned at the range of issues over which water companies have complete discretion, including whether or not to introduce a social tariff at all (CAB, 2012: 2).

Similarly UNISON stated that it

Would not be acceptable for a different standard of social tariff to operate on a company by company basis. Instead Government should, as a matter of public policy, design a model social tariff for adoption by each water company (2011: 5).

Rather than leave the entirety of the social tariff design to the water companies, these organisations would prefer to see a minimum standard stipulated by government so that service levels do not become wildly uneven between water company areas. Without explicit guidance from the government regarding who should be eligible for social tariffs, water companies have had to play a more proactive role in understanding their customer base in order to design an appropriate social tariff. Here companies have been encouraged to 'own the relationship' between customer and water company. In this sense the accountability for water welfare has been reconfigured, with the authority to determine who is eligible for help with their bulls becoming the responsibility of the water company. In line with the Conservative Party's Big Society inspired preference for localism and greater involvement of the private sector, water companies have been afforded greater accountability for social policy through affordability mechanisms in relation to water. This has important ramifications for how the state is understood in the waterscape as well as who is able to access support with paying their water bills.

7.11 Producing new subjectivities and identities of the "deserving poor"

In practice SRN and SEW have designed slightly different company tariffs (both called the Support Tariff) to accompany their respective metering programmes. The two tariffs are similar in that they target households who have experienced hardship as a direct result of metering. Therefore these mechanisms are not designed to tackle broader affordability patterns.[57] Should households prove eligible for a social tariff, their bills are capped at their previous unmeasured charges. This would certainly help those who have experienced a substantial increase in bills, yet it would do little for those who had found their unmeasured bill unaffordable. These support tariffs are targeted at a relatively small[58] number of households and qualification for the support tariffs, particularly SRN's, involve the applicant passing through a number of lengthy and, arguably intrusive, steps (see Table 24 for a brief outline of the application process of SEW and SRN's support tariff). Water users must *demonstrate* that they are not able to meet the cost of their new metered bills and have adopted reasonable water efficiency measures. Both water companies make the case that the conditional nature of water efficiency measures were appropriate as a matter of fairness in that, according to their customer research, other bill payers are reluctant to cross-subsidise the bills of those who are profligate with water. Here the support tariffs play an important role in delineating new regimes of truth and forms of knowledge regarding who is deserving of and who should be eligible for support. This, in turn, unintentionally produces new subjectivities of the deserving poor.

[57] Southern Water are in the process of designing an additional social tariff which it had hoped to pilot in 2013 following the implementation of the DWP's much delayed Universal Credit benefit system reorganisation. It plans to pilot its new tariff with around 2, 000 households (SRN, 2013: 29). Thames Water have also proposed a social tariff that 'will use a small increase in bills for the majority of customers to reduce charges for those who most struggle to pay'. It anticipates that this tariff will 'assist a relatively small number of customers' (Thames Water, 2013a: 12.).

[58] Although absolute target numbers are not available, it is quite clear that SEW's tariff is directed at a relatively small proportion of their customers whose bills increase as a result of the metering programme and whose household income is very low. SRN intend to conduct around 108 000 Green Doctor visits over the course of the five year metering programme which will see approximately 500, 000 meters being installed (**interview, 26.01.2012**). Not all recipients of Green Doctor checks would be eligible for the support tariff.

Table 24 Outline of SEW and SRN's support tariff application process

South East Water	Southern Water
1. The customer must see a bill increase in excess of £60 as a result of compulsory metering. 2. Applicants must have a basic income that is below £15, 860.[59] 3. The applicant receive a free water and energy audit and accept water efficiency devices and advice where appropriate. 4. Applicants must agree to receive a financial ins and outs survey.	1. Applicants must have faced increased bills due to the Universal Metering Programme (SRN have contracted Experian to help identify households who may be at risk) 2. Must receive a free water and energy audit and accept water efficiency devices and advice where appropriate. 3. Applicants must receive a benefits entitlement check and income assessment provided by a Community Interest Company called IncomeMAX who then advise Southern if households should receive the support tariff.

As Table 24 indicates, being on a low income is not enough to qualify a household for the support tariff, eligibility hinges on two further criteria. Households must demonstrate that they (1) have taken steps to become more water efficient and (2) are "genuinely" unable to pay for bill increases caused by compulsory water metering. Here the two companies have sought to marry affordability mechanisms to the broader water efficiency and behaviour change agenda (see chapter six for more on the influence of behavioural change in the water sector).

As part of this process, before the company is willing to commit to providing the applicant with financial help its support tariff, SEW and SRN customers must participate in a free of charge water and energy efficiency assessment. This, according to SEW is to 'determine whether more efficient use of water at the customer's property could reduce the size of future metered bills' (SEW, 2012: 14). In SRN's case, eligibility for the social tariff is conditional on households 'accept[ing] any reasonable and practical offer' that is made to install water efficient devices in the applicant's home (SRN, 2013a: 7). It is not my intention to admonish the importance of water efficiency measures and the savings that can be made through the installation of the gratis water efficiency measures and advice offered by SRN and SEW. However, this process is important because it produces particular images of the type of household that is deserving of help under these schemes.

[59] Income must include everything except: Child Tax Credit, Disability Living Allowance, Attendance Allowance, Housing Benefit and Council Tax Benefit, Mortgage Interest Relief and Pension Credit.

In this respect, the name of SRN's scheme is instructive. SRN have worked closely with a local charity called Groundwork to provide the Green Doctor service. Complementing the positioning of the meter as a device that gives households greater control over the water bill (see chapter six), SRN have emphasised how the main purpose of the Green Doctors Intervention is to assist customers in a better understanding of how 'the meter could work for rather than against' them (Green Doctor visit, 26.01.2012). The title Green Doctors is discursively problematic, yet important, in constructing an idea of the deserving poor; it implies the existence of an illness or sickness, in this case being potentially water inefficient, which needs to be treated. It follows then that households are considered deserving of support only if they are, or are actively seeking to become more, water efficient.

In addition to agreeing to water efficiency measures, applicants must also *demonstrate* that they are 'unable to afford that increase in charges' (SRN, 2013a:7). SEW assess whether households can "genuinely" afford bill increases through an in-house financial ins and outs survey whereas SRN have employed the services of an external partner, IncomeMAX. Here there are additional hurdles to pass before the customer is able to access SRN's Support Tariff. On behalf of SRN customers, IncomeMAX administers a benefits entitlement check to assess whether there are any state benefits that the household is entitled to but not receiving that might raise their income. Subsequently, households must undergo an income and expenditure assessment to identify the amount of money that the household has 'available to pay towards any increase in… service charges following the switch to metering' (SRN, 2013a: 7). IncomeMAX then contacts SRN and, in a far from transparent process, recommends whether households should receive assistance with the increase in their water charges (unsuccessful applicants can appeal through the CAB) and the household then must complete and return an application form for the Support Tariff within 30 days of the income and expenditure assessment being completed. This convoluted process of assessment places considerable emphasis on applicants *demonstrating* that they have undertaken water efficiency measures and, as often described in the sector, they are *genuinely* unable to afford bill increases. In this sense, the deserving poor are adjudged to be those who are both water efficient and demonstrated the extent of their need through investigation of their finances. Here, responsibility for providing water welfare has been effectively privatised.

The Support Tariffs have eased the transition to metering for some households. For example, SRN has recently claimed that its benefits entitlements service has, in around two years,

‘helped customers secure more than £1 million in benefits that they did not know they were entitled too’ (SRN, 2012b). This translates to an average of £1, 700 for each household SRN has worked with (SRN, 2012b). Nonetheless, the lengthy process that households have to undergo in order to access SRN's, and to a lesser extent SEW’s, Support Tariff, which cap bills at the previous unmeasured charge, is intrusive and is likely to result in a relatively small number of applicants. Experience of the WaterSure tariff suggests that where an application process is complex or not widely advertised, take up tends to be low. In addition to making support conditional on agreeing to water efficiency measures, adding an excessive additional burden of proof onto those applying for help with their water bill suggests that the water company is reluctant to provide support unless it absolutely has to and all other sources of support have been exhausted. It is clear that both SRN and SEW have taken their new responsibilities seriously yet their respective approaches raise questions as to whether company social tariffs are the best possible solution to manage affordability problems. The way that companies have sought to manage affordability problems caused by compulsory metering reflect a reshaping in the way the state is understood and the production of different subjectivities surrounding the deserving poor that link eligibility much more closely to commitment to water efficiency.

7.12 Conclusion: renegotiating the state, the water company as (reluctant) water welfare provider

This chapter has drawn on Foucauldian tools to explore how the ‘problem’ of water affordability has been discursively represented and recognised as a serious concern that requires immediate management. The chapter traced how the notion of water affordability has been constructed in different ways, and by different actors, to justify (in)action over water affordability. Here understandings of what constitutes water poverty, and how that should be measured, have been deeply contested. The chapter has demonstrated that way the ‘problem’ of affordability is understood has important implications for the manner of support offered and how the state is understood in that context. Examining the process whereby particular understandings and ways of managing water affordability become dominant provides insight into how the role of the state has been negotiated and renegotiated.

The chapter demonstrated that companywide compulsory metering represented an important juncture for these programmes presented a new challenge, and a different distribution of charges, that would have substantial impacts on patterns of water affordability. Although the issue of affordability was not initially interrogated in relation to compulsory metering, unintentionally, the introduction of these metering programmes contributed to water affordability being viewed as a distinct, biopolitical, problem that required active management. Following public inquiry, and under pressure from the CCW, water companies had to seriously consider the influence that metering would have on its customers. This chapter has shown that the meter can influence in both positive as well as negative ways. Importantly the meter should be read as an ambivalent technology that can both entrench and cause negative outcomes but, at the same time, can lead to positive outcomes for some households. In order to manage water affordability problems related to compulsory metering, the role of the water company has been stretched to include responsibility for designing and delivering forms of water welfare.

In the context of the Conservative Party's commitment to Big Society politics, water companies have been encouraged to take responsibility for managing water affordability problems caused directly by the introduction of compulsory metering. Water affordability has been articulated as a local problem that is best understood and managed by individual water companies. This represents a substantial reshaping of roles and responsibilities in the waterscape. In addition to its responsibility for collecting and managing water debt, the role of the private water company has been stretched to encompass a more explicit water welfare responsibility. This chapter has shown that companies undertaking compulsory metering have taken this responsibility seriously, nonetheless some have expressed reluctance regarding their new role. Reshaping of the role of water companies has not been an entirely smooth process; other actors in the sector have disputed and resisted the role of water companies in managing water affordability. Moreover, consumer groups have thrown considerable doubt on whether treating affordability as a local problem that requires local solutions, thus enabling companies to offer substantially different programmes, is the best way of organising water affordability solutions. Here CCW, in particular, have questioned whether these types of schemes will be able to raise sufficient capital for substantial programmes of support.

The Support Tariffs produced by SRN and SEW have resulted in the compulsory water metering programmes being more sensitive to water affordability problems than would have

otherwise been the case. Here the eligibility criteria developed by water companies, particularly SRN's criteria, contributes to producing an understanding of the deserving poor that is explicitly linked to water efficiency commitments (see chapter six) and judgement from a financial company that households cannot afford to pay the increases in their water charges. While providing much needed help to a minority of households to cope with the transition to metering, support is conditional on traversing a lengthy and, at times, intrusive application process. The reshaping of the role of the water company as a reluctant welfare provider thus has broader implications for how the "deserving poor" water user is perceived.

Overall, this chapter builds on broader debates about the role of the state in water governance by focusing on the repositioning of private water companies as, at times reluctant, water providers. Allocating the private water company with responsibility for designing and delivering a water welfare safety net has substantial implications for the role of the state in the water sector. Importantly, providers of water affordability schemes are not directly accountable to a democratic body. Instead, individual private water companies are accountable to Ofwat and, indirectly, their customers. This raises important questions about how decisions are made in the waterscape, particularly how changes to the way that water welfare provision is delivered can be affected by water users. Companies attempt to gauge support for affordability mechanisms by opening customer consultations throughout the development of their WRMPs and business plans, furthermore forthcoming price reviews will see customer representatives including the CCW and other organisations such as the CAB sit on customer review panels for this purpose. There is, however, no opportunity to vote for change as there would be should the government have greater responsibility for the design and delivery of these policies. This chapter shows that the decision to encourage water companies to manage water affordability problems caused by metering has important ramifications for understanding the state, and the private water company, in South East England.

8 Conclusion – measuring fairness, reproducing the waterscape

8.1 Introduction

This chapter performs three main functions. It (1) outlines the main findings and conclusions of the thesis, (2) highlights the policy implications of the findings and proposes recommendations, and (3) suggests directions for future research that could build on the thesis findings.

This final chapter begins by bringing together the main findings from chapters four, five, six and seven in order to respond to the research questions described in chapter one. This section briefly summarises how compulsory metering emerged, from the perspective of some water companies and stakeholders, as a legitimate way of governing the waterscape, how the water meter has been used to influence the way water and water users are governed and how the introduction of compulsory water metering has, inadvertently, led to companies taking greater responsibility for water welfare. This section also outlines the significance of the thesis' main findings.

The chapter then discusses the policy implications that follow from this thesis. This part of the chapter offers a series of recommendations and questions that policy makers may wish to consider regarding the role of feedback mechanisms in compulsory water metering programmes and the shape and form of affordability mechanisms. Finally, the chapter outlines directions for future research that could build on the findings in this thesis.

8.2 Main findings and contributions

This section outlines the contribution that this thesis makes to existing work on governing water and water users.

Chapters four and five used Foucauldian inspired tools to develop a genealogy of water metering (1840-2009) which demonstrated how the meter, as a contingent technology has been used to negotiate and renegotiate the waterscape. This genealogy is vital for two reasons: it is important for better understanding the emergence of compulsory companywide metering programmes in the contemporary moment and for exploring how notions of fairness have been articulated in relation to metering. This thesis demonstrates the importance of

Foucauldian genealogical tools for better understanding how and why particular policy interventions emerge in the contemporary moment.

This genealogy of water metering from 1840-2009 is important in a second sense; it provides insight into how any why contemporary compulsory water metering programmes have emerged, from the perspective of some companies and stakeholders, as desirable policy interventions in the South East of England (see research question one). Here, following Foucault, this genealogy offers a history of the present. This genealogy is an important and effective way of conveying that the decision to adopt and implement compulsory metering was not ahistorical. Here this thesis, by developing an extensive genealogy of metering, builds on and takes forward existing work on metering in England and Wales by providing insight into how and why compulsory companywide metering was introduced in parts of South East England. This genealogical approach demonstrates the value of historicising contemporary policy interventions; this is particularly clear in relation to arguments surrounding metering and fairness.

The thesis has shown that the meter has been pivotal in reflecting, communicating and managing different ideas of fairness in relation to water supply and charging. Water metering interventions, in their different guises, have been pivotal in helping to reproduce the waterscape. These chapters stressed that the meter, as a contingent technology, can be, and has been, utilised to provoke a range of outcomes that can be considered more or less positive or more or less "fair". Here the meter has proved to be an important fulcrum around which debates surrounding fairness materialised. Importantly, the thesis did not impose a criteria for fairness, instead it analysed the multiple ways that fairness was understood in relation to metering.

Persistently, water metering programmes have been central to debates surrounding what constitutes fairness in the water sector. Fairness has been understood in multiple, and sometimes contradictory, ways. Consistently, metering has been depicted rather crassly. Metering programmes have often been perceived to be an unfair intervention that represents a disproportionate tax on the poor. In contrast, the meter has also been understood as an instrument that enables a fair charging system by encouraging water users to "pay for what you use" and aligning more closely with cost recovery mechanisms. Moreover, metering has also been positioned as a facilitator of fairness in socio-ecological terms where financial

incentives are thought to be instructive in efforts to alleviate water stress. In this sense debates around metering have often (but not always) positioned biopolitical concerns and economics as antithetical. This binary representation is unhelpful. Water metering has the potential to rework the waterscape in multiple ways which can be to be more or less fair to the water company, the environment and the water user. The meaning of fairness in this context has been struggled over, with claims and counter claims regarding the dimensions of fairness and the extent to which metering can be considered fair.

In this context, the two chapters exposed how the meter has been used to help ensure constant supply of water, mediate understandings of domestic and profligate use, discipline payment, and secure water supplies in the context of water stressed conditions. The reasoning for introducing metering differed across the genealogy and the object of metering (pipes, payment, water use practices) changed over time. This genealogy is important because it helps explore the multiple ends that metering can serve; understandings of fairness in relation to water metering are not static. The different uses of metering represent struggles over what the waterscape should look like and, importantly, what constitutes fairness in relation to water provision. In illustrating the important of Foucauldian inspired genealogical approaches, this thesis makes a valuable contribution to existing literature by demonstrating the importance of historicising contemporary policy interventions and highlighting the multiple possibilities for the relationship between metering and fairness.

Chapter six focused on how the introduction of compulsory water metering influenced the way that water and water users are governed in South East England (research question two). The thesis argued that one of the key motivations for embarking on compulsory metering was that water companies were seeking to resolve a tension between perceived profligate water use and water supplies that are considered to be stressed.

In analysing this sociotechnical fix, the thesis offered Harvey's work on moments as an effective interpretative framework. The chapter identified a series of moments that were loosely based on Harvey's: relations of production (the RCM), technology (smarter meters), ideas (nudge), the role of the water company and its relationship with domestic water users, relations to nature (the true value of water), socialising water (paying for what you use) and intervening in everyday interactions with water (through feedback mechanisms). Here the thesis argued that the different moments are interrelated and evolve dynamically to reproduce

the waterscape. The framework is vital for examining the messy and non-linear character of policy interventions such as metering and for explaining processes of sociotechnical change in neoliberal environments.

In this context, the chapter found that contemporary compulsory metering programmes have been used as a way to encourage households to value water differently, nudge water users' behaviour and promote an altered interpretation of fairness. These metering schemes differed from previous metering programmes in that companies sought to actively guide and intervene in peoples' everyday water use through nudge inspired interventions. In this sense, the thesis built on existing work on metering by identifying an emergent, if not fully realised, nudge inspired governmentality. By drawing on Foucault's concept of governmentality and Harvey's method of moments, while being conscious of the limitations of working with the two frameworks, this thesis built on existing literature by exploring the implications of compulsory water metering for how water and water users are governed.

The final, and perhaps most important, contributions that this makes are explored in chapter seven. Here the thesis examined the unanticipated outcomes of compulsory metering with respect to the relationship between metering and affordability. It revealed that the development of affordability mechanisms was an unanticipated outcome of the compulsory metering process; affordability issues were not considered in depth prior to the introduction of compulsory water metering. Subsequently, water companies have designed and developed specific mechanisms for managing water affordability problems resulting from the introduction of companywide compulsory metering. This, in turn, represents significant shifts in the allocation of governing responsibility and forms of democratic accountability in the water sector. The unanticipated outcomes of compulsory metering here illustrate Foucauldian insights regarding the non-linear contingencies of governance and have important implications for thinking about the role of the corporation in relation to public life.

The state has been rearticulated in light of water companies, at times reluctantly, taking on responsibility for water welfare problems resulting from compulsory metering. As chapter two discussed, the state is best understood as a fluid entity, or a series of social relations, that take concrete form at particular times. This reframing of water companies as water welfare providers has important ramifications for how the state is understood. Contrary to many accounts of neoliberal governance, where the state is thought to be retreating and

neoliberalism ‘rolled out’, this thesis has built upon Foucauldian and historical materialist approaches to the state. It has argued that, in the context of political posturing through transient notions of the Big Society, the complex web of state relations that make up the state have been re-spun so that water companies, if they choose to, become legitimate water welfare providers. This, in turn, has had important ramifications for processes of accountability in the water sector as well as the shape and form of affordability interventions. The unintended consequences of compulsory metering (where water companies have had to design and deliver forms of welfare) expose significant shifts in the role of the private water company in public life, the implications of which have not been fully realised and warrant further consideration.

8.3 Policy Implications and Recommendations

This section considers the policy implications of this research and offers some recommendations that might help inform future work in the water sector. Two main issues are covered. First, the section urges greater reflection regarding how water charges should be socialised through metering in England and, secondly, the section suggests that it would be advantageous if the sector were to revisit the way that water affordability is managed.

Compulsory water metering, as discussed in chapters six and seven, has important implications for how water is socialised in the South East of England. In this context, decisions have to be taken about what sort of services water companies should provide and how these services should be paid for. The thesis highlighted that the meter can be used in a variety of different scenarios to produce charging systems that look very different, distribute costs in ways that benefit some groups over others and reflect different principles of fairness. In particular, the chapter highlighted that, potentially, the meter can be used to structure a range of charging systems, all of which are imbued with different values. The thesis identified that the two companies undertaking compulsory metering have introduced straightforward volumetric tariffs alongside their respective metering programmes. In this context, further debate about what sort of role the meter should have in structuring the waterscape would be timely.

Installing meters does not necessarily require the introduction of a straightforward volumetric charge, and as discussed in chapter six, volumetric charging can promote water uses that are

antithetical to more sustainable water management. The decision to structure charges in particular ways is a political one and reflects the dominant ways in which fairness are understood (see chapters four, five and six). The genealogy of water metering developed in this thesis shows that, feasibly, water meters could support a wide range of volume based tariffs or could be used to provide information about in-home water use and report leakages without necessarily charging for water by volume. Clearly, with the introduction of compulsory metering, there is an opportunity for open debate and experimentation with different tariff options. Debate regarding how water costs should be socialised through compulsory metering are clearly linked to broader questions surrounding what the waterscape should look and feel like; water meters constitute just one, albeit very important, element in this debate. Here there is clearly greater scope for debate and discussion surrounding the shape of the waterscape, the meter's role in socialising costs and how fairness might be understood in that context.

Debate over how water costs are socialised is especially important given that water affordability is now recognised as an important and pressing problem in England (and Wales). There are, as chapter seven demonstrated, two different yet related strands of water affordability to consider: problems caused directly by the introduction of compulsory metering and broader ongoing affordability issues. Water companies have developed specific mechanisms to support some households who face higher bills as a direct result of compulsory metering, while some plan to introduce social tariffs to address broader affordability issues. As highlighted in chapter seven, and revisited further above in this chapter, the emergence of a Big Society inspired governmentality where private water companies are made accountable for forms of water welfare, has important implications for democratic accountability and how governing authority is distributed in the water sector. Despite water companies taking their responsibilities seriously, there remain concerns regarding the scope and form of affordability interventions led by water companies. Moreover, there is little sustained work being undertaken on the scale and characteristics relating to affordability problems.

As discussed in chapter seven, Ofwat undertook research in 2011 to establish some of the drivers and indicators of water affordability problems in England. Although the 2009 Walker Review had suggested that Ofwat should subsequently track and report on affordability issues at regular intervals, there are no plans for Ofwat to do so at the time of writing. Water

companies are expected to be abreast of the primary pressure points in their respective constituencies, yet the absence of explicit standardised means of reporting water affordability patterns precludes assessment of affordability issues being undertaken in a coordinated fashion or comparisons being made between different water company areas. The absence of such information makes evaluation of the problem and appropriate policy interventions difficult. It would be prudent, therefore, if an organisation collected, reported and analysed data on water affordability on a regular basis in a coordinated fashion in order to better understand the scale of the problem and the relative effectiveness of different ways of managing it. Such a responsibility might well fall within Ofwat's purview, yet the allocation of these tasks would require government action. Whichever organisation bore this responsibility, transparency in reporting data on affordability would be vital.

8.4 Directions for future research

This section suggests possible research directions by outlining how some of the work in this thesis might be followed up and extended. Subsequently, it sets out research ideas that might take this work in new directions.

This thesis has focused on compulsory metering in the South East of England. It is important to recognise that as this research was undertaken in the early stages of meter installation, some of the interventions associated with compulsory metering are in their infancy and, as a result, would constitute important avenues for future or follow up research. In particular, the water companies' use of nudge inspired feedback interventions demand further attention. As discussed in chapter six, at the time of conducting this research, it was not clear how the new nudge inspired bill format and greater information provision might influence water users' behaviour. These new tools could prove to be important. By engaging with nudge, behavioural economics and metering, this research has provided sound conceptual footing and important contextual information for new work on feedback mechanisms to build on.

In addition to follow up research on feedback mechanisms, there are substantial opportunities for pursuing detailed quantitative work on water consumption patterns following meter installation; such an approach was beyond the scope of this thesis. Should data be made available, independent research on how the introduction of water meters influences the way water flows through the home would be possible. Such work would be particularly interesting if it made a distinction between water saved through better leakage detection and changes in

household water use more broadly. In order to better understand how household water use might change following the introduction of metering, quantitative data on household water consumption would be enhanced if it were accompanied by qualitative work that provided insight into why particular changes might occur. In chapter five, this thesis highlighted that it is often assumed that meters produce a 10 per cent demand reduction, further research along the lines described in this section would provide more nuanced information about what type of demand reductions occur, at what times and why. This, in turn, would help inform policy on metering.

While this thesis has focused on compulsory water metering programmes underway in the South East of England, the research approach would be applicable to the study of other metering interventions in different areas of the UK and in different countries. What would be particularly interesting is the study of metering in areas where water is not considered to be under stress. In the South East of England, establishing a 'fairer' water charging system was an important motivating factor for introducing compulsory metering, yet the most immediate concern was the need to address the supply/demand balance. In areas where water stress is a less pressing issue, understandings of what constitutes fairness in relation to metering may differ. Teasing out how understandings of fairness are articulated and measured in different areas, especially in the context of Big Society politics, would be a valuable exercise and take the research in this thesis into new directions.

9 Bibliography

Abrams, P., 2006. Notes on the difficulty of studying the state. In Shama, A., & Gupta, A., (eds). *The Anthropology of the State.* Oxford: Blackwell.

Affinity Water. 2011. June Return 2011. Veolia Kent Water Southeast Ltd.

Agamben, C., 1998. Homo Sacer: Sovereign Power and Bare Life. Stanford: Stanford: University Press.

Agrawal, A., 2005. *Environmentality: technologies of government and the making of subjects* NY: Duke University Press.

Allen, J. and Cochrane, A. 2010. Assemblages of state power: topological shifts in the organisation of government and politics. *Antipode*. 42(5), 1071-1089.

Anais, S., 2012, Genealogy and critical discourse analysis in conversation: texts, discourse, critique. *Critical Discourse Studies.* 10(2), pp. 123 - 135.

Anderson, W. & White, V. 2009. *The Smart Way to Display: Exploring customer preferences for home energy display functionality*. Report to the Energy Savings Trust. Centre for Sustainable Energy: Bristol.

Anglian Water. 2013. Charges Scheme: 2013-2014 available online http://www.anglianwater.co.uk/_assets/media/Charges_Scheme_2013_to_2014_.pdf last accessed 15.07.2013.

Auriga Services Limited. 2011. Review of Charitable Trusts and other measures to help vulnerable customers in the water and energy sectors. London: Policy Consulting Network Ltd.

Bakker, K., 2001. Paying for Water: Water Pricing and Equity in England and Wales. *Transactions of the Institute of British Geographers,* 26(2) pp. 143-164.

Bakker, K., 2004. *An uncooperative commodity: privatizing water in England and Wales.* Oxford: Oxford University Press.

Bakker, K., 2005. Neoliberalising Nature? Market Environmentalism in Water Supply in England and Wales. *Annals of the Association of American Geographers*. 95(3), pp 542-565.

Bakker, K., 2010. The limits of 'neoliberal natures': Debating green neoliberalism. *Progress in Human Geography,* 34(6), pp. 715-735.

Bakker, K., 2012. Water: political, biopolitical, material *Social Studies of Science,* 42(4), pp. 616-623.

Bakker, K. & Bridge, G. 2006. Material Worlds? Resource Geographies and the 'matter of nature'. *Progress in Human Geography*, 30(5), pp. 5-27.

Barnes, J., 2012. Pumping possibility: Agricultural expansion through desert reclamation in Egypt. *Social Studies of Science*. 42(4), pp. 517-538.

Barnett, C., 2005. The consolations of 'neoliberalism' *Geoforum* 36(1), pp. 7-12.

Barraque, B. 2011. Is Individual Metering Socially Sustainable? The Case of Multifamily Housing in France. *Water Alternatives* 4(2), 223-244.

Barry, A., 2001. *Political Machines: Governing a technological society.* London and New York: Althlone Press.

Barry, A. 2006. Technological Zones, *European Journal of Social Theory,* 9(2), pp. 239-253.

Barry, A., Osborne, T., and Rose, N., (eds). 1996 *Foucault and Political reason: Liberalism, neo-liberalism and rationalities of government*. UCL Press: London.

Bayliss, K., & Fine, B., (eds) 2009. *Privatization and Alternative Public Sector Reform in Sub-Saharan Africa: Delivering on Electricity and Water*. Basingstoke: Palgrave Macmillan.

Baxter, J., & Eyles, J., 1997. Evaluating qualitative research in social geography: establishing 'rigour' in interview analysis. Transactions of the Institute of British Geographers, 22(4). Pp. 505-525.

Baxter, J. 2010. Case Studies in Qualitative Research. In Hay I (eds) "*Qualitative" Research Methods in Human Geography (3rd Edition)*. Oxford University Press: Ontario.

Becker, G.,1962. Irrational Behaviour and economic theory. *Journal of Political Economy* , 70(1). Pp. 1-13.

Bellamy-Foster, J., 2000. *Marx's Ecology: Materialism and Nature.* NY: Monthly Review Press

Bell, V. 1996. The promise of liberalism and the performance of freedom. In Barry, A. Osborne, T and Rose N. (eds). 1996. *Foucault and Political Reason: liberalism, neo-liberalism and rationalities of government*. UCL Press: London

Bennet, O., Alyesi, C., & Bolton, 2013. Water bills – are they affordable to all? House of Commons Library Standard Note SNSC-06596.

Bentham, D. 2012. Your Interview: Darren Bentham from Southern Water *The Argus* available online http://www.theargus.co.uk/news/10082232.print/ last accessed 11/09/2013.

Benzie, M. Harvey, A. Burningham, K. Hodgson, N. & Siddiqi, A. Feb 2011, *Vulnerability to heatwaves and drought: Case studies of adaptation to climate change in South-West England*, Joseph Rowntree Foundation.

Berg, N. & Gigerenzer, G. 2010. As-if behavioural economics: neoclassical economics in disguise? *History of Economic Ideas* 18(1), 133-166.

Bikjer, W., 2007. Dikes and Dams: Thick with Politics *Isis* 98, pp. 109-123.

Bird, P., & Jackson, C., 1965. Water meters: why not? *New Society* . pp. 11-13.

Boyland, A., 2010. Report to the Secretary of State for Environment Food and Rural Affairs: Inquiry into the South East Water Management Plan 2010-2035. Available online at: http://archive.defra.gov.uk/environment/quality/water/resources/documents/101203-inquiry-report.pdf last accessed 05.04.2012.

Bradbury, A., McGimpsey, I.,& Santori, D., 2013. Revising rationality: the use of 'Nudge' approaches in neoliberal education policy *Journal of Education Policy* 28(2), pp. 247-267.

Brain, D., 1994. Cultural production as "society in the making": Architecture as an exemplar of the social construction of cultural artefacts. In Crane, D., (eds). *The Sociology of Culture,* Oxford: Blackwell.

Braun, B. & Castree, N. (eds) 1998, *Remaking Reality: Nature at the millennium*, Routledge, New York.

Braun, B. & Whatmore S (eds) 2010. Political Matter: Technoscience and public life. University of Minnesota Press: Minneapolis & London.

Brighton Palestine Solidarity Campaign *BHPC activist wins concession from Southern Water over Israeli-made water meter* available online: http://www.brightonpalestinecampaign.org/local-news-reports/bhpsc-activist-wins-concession-from-southern-water-over-israeli-made-water-meter last accessed 19.09.2013.

Brockling, U., Krasman, S., & Lemke, T., (eds). 2011. *Governmentality: Current Issues and Future Challenges.* New York & London: Routledge.

Budds, J., 2009. Contested H20: science, policy and politics in water resources management in Chile. *Geoforum* 40(3), pp. 418-430.

Budds, J. & Hinojosa, S., 2012. Restructuring and rescaling water governance in mining contexts: the co-production of waterscapes in Peru. *Water Alternatives,* 5(1). Pp. 119-137.

Bulkeley, H., & Schroeder, H., 2012. Beyond state/non-state divides: Global cities and the governing of climate change. *European Journal of International Relations* 18(4), pp. 743-766.

Burchell, G., 1996. Liberal government and techniques of the self in *Foucault and Political Reason: liberalism, neo-liberalism and rationalities of government.* (eds). A. Barry, T. Osborne & N. Rose. London: UCL Press. pp. 19-37.

Byatt, I., 2004. Managing Water for the Future: The Case of England and Wales. In Trotter and Slack (eds) *Managing Water Resources* Oxford University Press: Oxford. Pp 73-88.

Cabinet Office, Department of Education & the Government Economic and Social Research Team (2011) Witten evidence from the government (joint submission). Available online at http://www.parliament.uk/documents/lords-committees/science-technology/behaviourchange/BCOralandWrittenEvCompiled180711.pdf 03.02.2012.

Carse, A., 2012. Nature as infrastructure: Making and managing the Panama Canal Watershed *Social Studies of Science,* 42(4). Pp. 131-563.

Castree, N., 2002. False Antitheses? Marxism, Nature and Actor Networks. *Antipode,* 34(1), pp. 111-146.

Castree, N., 2003. Commodifying what nature? *Progress in Human Geography,* 27(3), pp. 273-279.

Castree, N., 2008a. Neoliberalising nature: the logics of deregulation and reregulation. *Environment and Planning A,* 40(1), pp. 131-152.

Castree, N., 2008b. Neoliberalising Nature: Processes, Effects and Evaluations. *Environment and Planning A,* 40(1) pp. 153-174.

Cave, M., 2009. Independent Review of Competition and Innovation in Water Markets: Final Report. Available online from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69462/cave-review-final-report.pdf last accessed 25.02.2014.

Central Advisory Water Committee. 1959. Sub-committtee on the Growing Demand for Water. First report. London: HMSO.

Central Advisory Water Committee. 1962. Report of the Sub Committee on the Growing Demand of Water. Final Report. London: HMSO.

Chappells, H., & Medd, W., 2008. What is fair? Tensions between sustainable and equitable domestic water consumption in England and Wales. *Local Environment*. 13(8), pp.725-741.

Citizens Advice Bureau. 2011. *Affordable water: a consultation on the Government's proposals following the Walker Review of Charging, Citizens Advice to Defra.* London.

Citizens Advice Bureau. 2012. *Company social tariffs. Consultation on guidance to water and sewerage undertakers and the Water Services Regulation Authority under Section 44 of the Flood and Water Management Act 2010: Citizens Advice response to Defra*. CAB: London.

Clark, N., 2012. Renationalise English Water: The obscene commodification of a natural resource has gone on long enough, ripping off ordinary people. *The Guardian* available online at: http://www.guardian.co.uk/commentis free/2012/jan/31/renationalise-English-water last accessed 08.07.2013.

Climate Change Committee Adaptation Sub-Committee Progress Report. 2012. *Climate change – is the UK preparing for flooding and water scarcity*? London: Committee on Climate Change.

Conservative Party. 2010. *Big Society, not big Government* available online at: http://www.conservatives.com/news/news_stories/2010/03/~/media/files/downloadable%20files/building-a-big-society.ashx last accessed 12.11.20.

Consumer's Association. 1996. Water consumption and charges Policy Report.

Consumer Council for Water. 2006. *Using Water Wisely: Quantitative Research to determine consumers' attitudes to water use and water conservation*. MVA Consultancy: London.

Consumer Council Water. 2007. *Deliberative research into consumer view on fair charging for the Consumer Council for Water*. London.

Consumer Council for Water. 2009b. *Memorandum Submitted by Consumer Council for Water. Ofwat Price Review: Environment, Food and Rural Affairs Committee Evidence*. Fifth Report of Session 2008-2009 Volume II.

Consumer Council for Water. 2009c. *Annex to CCWater's submission on companies' Final Business Plans Southern Water*. Available online: http://www.ccwater.org.uk/server.php?show=nav.1122 last accessed 11/09/2013.

Consumer Council for Water. 2009d. *Annex to CCWater's submission on companies' Final Business Plans South East Water*. Available online: http://www.ccwater.org.uk/server.php?show=nav.1122 last accessed 11/09/2013.

Consumer Council for Water. 2010a. *Inquiry into South East Water's Water Resources Management Plan: CCWater London and South East Statement of Case*. Available online at http://archive.defra.gov.uk/environment/quality/water/resources/documents/100315-consumer-council-for-water.pdf last accessed 10.07.2013.

Consumer Council for Water. 2010b. *Cross subsidies and social tariffs: the consumer perspective*. Commissioned by the Consumer Council for Water. Creative Research Ltd: London.

Consumer Council for Water. 2010c. Annual Tracking Survey 2009. CCW: Birmingham.

Consumer Council for Water. 2010d. Cross Subisidies and Social Tariffs: The Consumer Perspective. CCW: Birmingham.

Consumer Council for Water. 2011. Annual Tracking Survey 2010. CCW: Birmingham.

Consumer Council for Water. 2011a. Response to Ofwat's consultation on involving customers in decisions about water and sewerage services. CC: Birmingham.

Consumer Council for Water. 2012. *Changes to WaterSure as a result of the introduction of Universal Credit: A Defra consultation*. CCW: Manchester.

Consumer Council for Water. 2013. *The Customer Impact of Universal Metering Programmes: Report of Research Findings* Creative Research/Accent: London.

Corporate Watch. 2013. *Arad: Supplying water meters to Sussex while helping bleed Palestine dry* Available online http://corporateoccupation.org/arad-supplying-water-meters-to-sussex-while-helping-bleed-palestine-dry/ last accessed 19.09.2013.

Counterclaim. 1995. Water: You don't have to pay for it. No.50.

Coutard, O., & Guy, S., 2007. STS and the City: Politics and Practices of Hope. *Science, Technology & Human Values*, 32(6), pp. 713-734.

Cowan, D., Morgan, K., McDermont, M., 2009. Nominations: an actor-network approach, *Housing Studies*. 24. Pp. 281-300.

Crampton, J., & Elden, S., (eds). 2007. Space, Knowledge and Power: Foucault and Geography. Aldershot: Ashgate publishing limited.

Crooke, J., 2011. Southern Water's Universal Metering Programme *Water Treatment and supply* Available online http://www.waterprojectsonline.com/case_studies/2011/Southern_Metering_2011.pdf last accessed 03.07.2013.

Cunningham, C.,Griffin, J., Laws, S., 1996. Water Tight: the impact of metering on low income families. London: Save the Children.

De Laet, M., & Mol, A., 2000, "The Zimbabwe Bush Bump: Mechanics of a fluid technology", *Social Studies of Science*, 30(2). pp. 225-263.

Deacon, R., 2003. *Fabricating Foucault: Rationalising the Management of Individuals.* Milwaukee: Marquette University Press.

Dean, M., 2004. *Governmentality: Power and Rule in Modern Society.* London: Sage ltd.

Deedat, H. & Cottle, E., 2002. Cost Recovery and Prepaid Water Meters and the Cholera Outbreak in KwaZulu-Natal. In *Cost Recovery and the Crisis of Service Delivery in South Africa*, eds. D. McDonald & J. Pape., London: Earthscan, pp. 81-97.

Department of Energy and Climate Change. 2013. Government action to help hardworking people with energy bills. Press release. Available online at: https://www.gov.uk/government/news/govt-action-to-help-hardworking-people-with-energy-bills last accessed 02.12.2013.

Department for Environment, Food and Rural Affairs. 1992. *Using Water Wisely*. HMSO: London.

Department for Environment, Food and Rural Affairs. 2004. Cross-Government Review of Water Affordability Report HMSO: London.

Department for Environment, Food and Rural Affairs. 2007a. *Government response to consultation on water metering in areas of serious water stress between 31 January to April 2007.* HMSO: London.

Department for. Environment, Food and Rural Affairs. 2007b. Water metering to become an option in long term plans. News Release 262/07 iisued 16 August 2007.

Department for Environment, Food and Rural Affairs. 2008a. *Future Water: The Government's Water Strategy for England*. HMSO: London.

Department for Environment, Food and Rural Affairs. 2008b. *A Framework for Proenviornmental Behaviours*. HMSO: London.

Department for Environment, Food and Rural Affairs. 2011a. *Defra's approach to regulatory reform*. HMSO: London.

Department for Environment, Food and Rural Affairs. 2011b. Affordable water: a consultation on the government's proposals following the Walker Review of Charging. HMSO: London.

Department for Environment, Food and Rural Affairs. 2011c. Water for Life: Water White Paper. HMSO: London.

Department for Environment, Food and Rural Affairs. 2012a. *Defra's Strategic Policy Statement for Ofwat: Draft for Consultation* Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82656/consult-sps-seg-doc-20121112.pdf last accessed 01.12.2013.

Department for Environment, Food and Rural Affairs. 2012b. Company Social Tariffs: Guidance to water and sewerage undertakers and the Water Services Regulation Authority under Section 44 of the Flood and Water Management Act 2010. HMSO: London.

Department for Environment, Transport and the Regions. 1998. Water charging in England and Wales: Government Decisions following consultation. DETR: London.

Dermitt, D. 1998, Science, social constructivism and nature. in *Remaking Reality: Nature at the Millennium*, eds. B. Braun & N. Castree, Routledge, New York, pp. 173-193.

Dittmer, J., 2009. Textual and Discourse Analysis. In DeLyser, D., Crang, M., McDowell, L., Aitken, S., Herbert, S. (Eds.). *SAGE Handbook of Qualitative Research in Human Geography*, pp. 274-286. London: SAGE Publications.

Dobson, F., 1995. Licensed to Leak: How the Tories let the water companies off the hook. Labour Party: London.

Dobson, F., 1996a. More Money Down the Drain: Water leakages and water profits. Labour Party: London.

Dobson, F., 1996b. The Waterfacts of Privatisation: Failure, waste and greed in the privatised water industry 1990 – 95. Labour Party: London.

Dobson, F., 1996c. Ending the Waste: Labour's plans for a world class, water-efficient, sustainable water industry. Labour Party: London.

Dobson, F., 1996d. Floods of cash, floods of excuses: Labour's 1996 annual report on the privatised water industry. Labour Party: London.

Doron, N., 2011. Water use in Southern England: What do the public think is fair? Fabian Society: London.

Doron, U., The, T., Haklay, M., & Bell, S., 2011. Public Engagement with water conservation in London. *Water and Environment Journal*. 25(4), 555-562.

Doward, J. 2011. 'Water poverty' to rise in the UK as scarcity pushes up bills *The Guardian* available from http://www.theguardian.com/environment/2011/feb/20/water-poverty-uk-scarcity-bills last accessed 06.12.2012.
Drakeford, M., 1998. Water Regulation and Pre-Payment Meters, *Journal of Law and Society*, 25(4), pp. 588-602.

Dreyfus, H., L. & Rabinow, P., 1982. *Michel Foucault: beyond structuralism and hermeneutics.* Brighton: Harvester.

Eagle, M., 2013. Cameron still refuses to require water companies to introduce a social tariff – Maria Eagle. Labour Press Release Nov 1st 2013 available online at: http://press.labour.org.uk/post/65700778122/cameron-still-refuses-to-require-water-companies-to last accessed 03.12.2013.

Ekers, M., & Loftus, A., 2008. The Power of Water: developing dialogues between Foucault and Gramsci. *Environment and Planning D: Society and Space,* 26(4), pp. 698-718.

Elden, S. 2007, Rethinking Governmentality, *Political Geography,* 26(1), 29-33.

Energy Saving Trust. 2013. At home with water. EST: London.

England, K., 1994. Getting Personal: Reflexivity, Positionality, and Feminist Research. *Professional Geographer. 46(1)*, pp. 80-89.

Environment Agency. 2007. *Areas of Water Stress: Final Classification*. HMSO: Bristol.

Environment Agency., 2008a. *Water resources in England and Wales – current state and future pressures*. Bristol: Environment Agency.

Environment Agency. 2008b. *Using Science to create a better place: the costs and benefits of moving to full metering*. HMSO: Bristol.

Environment Agency. 2009. *The impact of household water metering in South East England*. HMSO: Bristol.

Environment Agency and Natural Resources Wales, 2013. Water stressed areas – final classification. Available online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf last accessed: 17.08.2013.

Environment, Food and Rural Affairs Committee (EFRA). 2009. *Ofwat Price Review 2009* Fifth Report of Session 2008-09 Volume I. HC 554-I.

Environment, Food and Rural Affairs Committee (EFRA). 2012. *The Water White Paper* Vol 2 20 June 2012. HM Stationary Office: London.

European Environment Agency. 2013. Assessment if cost recovery through pricing of water. Technical Report 16/2013.

Fairclough, N., 2003. *Analysing Discourse: Textual Analysis for Social Research*. London: Routledge.

Fairness on Tap coalition. 2011. *Making the Case for Metering*. Available online at http://assets.wwf.org.uk/downloads/fairness_on_tap.pdf last accessed 29.11.2011.

Featherstone, D., Ince, A., Mackinnon, D., Strauss, K., & Cumbers, A., 2012. Progressive localism and the construction of political alternatives *Transcations of the Institute of British Geographers* 37(2), pp. 177-182.

Feenberg, A., 1999. *Questioning Technology.* London and New York: Routledge.

Feenberg, A., 2002. *Transforming technology: A critical theory revisited. Oxford & New York: Oxford University Press.*

Feenberg, A. 2011. Afterword: The liberation of nature in A Biro (eds) *Critical Ecologies: The Frankfurt School and Contemporary Environmental Crises* Toronto and London: University of Toronto Press, 187-206.

Fine, B., 2005. From Actor Network Theory to Political Economy. *Capitalism Nature Socialism*, 16(4). Pp. 91-108.

Fitch, M., & Price, H., 2002, *Water Poverty in England and Wales*, Chartered Institute of Environmental Health & Centre for Utility Customer Law.

Flick, U. 2009. *An Introduction to Qualitative Research* (ed 4). London: Sage.
Fontana, A., & Prokos, A., 2007. The Interview: From formal to postmodern. California: Left Coast Press, Inc.

Foucault, M., 1988. Technologies of the Self. In Martin, L., Gutman, H., & Hutton, P., *A seminar with Michel Foucault*. Massachusetts: The University of Massachusetts Press Pp. 16-50.

Foucault, M., 2004 [1975-6]. Society Must Be Defended. Lectures at the College de France. Trans. David Macey. London:Penguin:.

Foucault, M., 1976. The Meshes of Power. In Crampton, J., & Elden, S., 2007. *Space, knowledge and power: Foucault and Geography*. England: Ashgate Publishing Ltd. Pp. 153-163.

Foucault, M., 1977. Nietzsche, genealogy, history. In D Bouchard (Ed) *Language, counter-memory, practice: Selected essays and interviews,* NY: Cornell University Press. Pp. 139 - 164.

Foucault, M., 2003. *Society Must be Defended: Lectures at the Collège de France, 1975-76*. Translated by David Macey. London: Penguin.

Foucault, M., 2008 [1978]. *The Birth of Biopolitics*. Ed. Senellart, M., Translated Burchell, G., London: Palgrave Macmillan.

Foucault, M., 1979. *History of Sexuality: volume 1*. London: Penguin Books.

Foucault, M. 1980. Two Lectures. In C Gordon (eds) *Power/ Knowledge: Selected interviews and other writings 1972-77* New York: Pantheon, pp 78 -108.

Foucault, M. 1991 [1975]. *Discipline and Punish: The Birth of the Prison*. Penguin Books: London.

Foucault, M. 1994. On the genealogy of ethics: An overview of a work in progress. In H. Dreyfus & P Rabinow (eds) *Michel Foucault, beyond structuralism and hermeneutics. Pp.* 253 -280.

Foucault, M., 2009. *Security, territory, population: lectures at the Collège de France.* Basingstoke: Palgrave MacMillan.

Foucault, M. 2010. [1982-1983] *The Government of the Self and Others*. Ed. Frederic Gros. Translated by Burchell, G. London: Palgrave Macmillan.

Furlong, K., 2010. Small Technologies, big change: Rethinking infrastructure through STS and geography. *Progress in Human Geography,* pp. 1-23.

Furlong, K., 2013. The dialectics of equity: consumer citizenship and the extension of water supply in Medellin, Colombia *Annuals of the Association of American Geographers,* 103(5), 1176-1192.

Gandy, M., 1999. The Paris Sewers and the Renationalisation of Urban Space, 24(1). Pp.23-44.

Gandy, M. 2003. *Concrete and Clay: reworking nature in New York City* Massachusetts and London: MIT Press.

Gandy, M. 2004a. Water, modernity and the emancipatory city in *The emancipatory city? Paradoxes and possibilities.* (eds). L. Lees. London: Sage. Pp. 178-191.

Gandy, M. 2004b. Rethinking urban metabolism: water, space and the modern city *City* 8(3), 363-379.

Ghertner, D., 2010. Calculating without numbers. *Economy and Society*. 39(2). Pp. 185-217.

George, Kent, ltd., 1938. *A volume of reminiscences and pictures in commemoration of the firm's centenary 1938-1939.* Luton: George Kent Ltd.

Giddens, A., 1984. *The Constitution of Society* Cambridge: Polity Press.

Gill, N., & Gill, M., 2012. The limits to libertarian paternalism: two new critiques and seven best-practice imperatives *Environment and Planning C: Government and Policy* 30(5), pp. 924-940.

Gleick, P., 1998. The human right to water. *Water policy,* 1(5). Pp. 487-503.

Goodwin, T., 2012. Why we should reject 'nudge'. *Politics,* 32(2), pp. 85-92.

Gordon, C., 1991. Governmental rationality: an introduction. In Burchill, G., Gordon, C., &

Miller, P., (eds)., *The Foucault Effect: Studies in Governmentality*, London: Harvester Wheatsheaf. Pp. 293-72.

Goyal, M., & Hall, M., 1992. Analysis of Domestic Water Metering. WRc: Swindon.

Graham, S., & Marvin, S., 2001, *Splintering Urbanism: Networked Infrastructures, Technological Mobilites and the Urban Condition,* London: Routledge.

Gray, D., 2011. *Review of Ofwat and consumer representation in the water sector*. London: Defra.

Gray, A., 2013. Southern Water to please for price increases *Financial Times* available online at: http://www.ft.com/cms/s/0/e3b5f244-aa1b-11e0-958c-00144feabdc0.html#axzz2mPQjk3Jb last accessed 15 January 2012.

Gregory, D., 2006. Introduction: Troubling Geographies in N Castree and D Gregory (eds) *David Harvey: a critical reader* London: Blackwell Publishing.

Guy, S., & Marvin, S., 1997. Planning for Water: Space, Time and the Social Organisation of Natural Resources. *School of Architecture, Planning & Landscape Global Urban Research Unit, University of Newcastle upon Tyne.*

Guy, S. Marvin, M. Medd, W. Moss, T. 2011. Shaping Urban Infrastructures: Intermediaries and the Governance of Socio-Technical Networks. London and Washington: Earthscan.

Halliday, S., 2001. The Great Stink of London: Sir Joseph Bazalgette and the Cleansing of the Victorian Metropolis. Abingdon: The History Press Ltd.

Hand, M., Shove, E., & Southerton, D., 2005. Explaining Showering: a discussion of the material conventional and temporal dimensions of practice. *Sociological Research Online* 10(2).

Haraway, D., 1988. Situated knowledges: the science question in feminism and the privilege of partial perspective. *Feminist Studies*. 14(3). Pp. 575-599.

Haraway, D.,1990. A manifesto for cyborgs: science, technology & socialist feminism in the 1980s in *Feminism/Postmodernism*, ed. L. Nicholson. New York & London: Routledge, pp. 190-233.

Haraway, D. 1991. *Simians, Cyborgs and Women: The Reinvention of Nature.* London: Free Association Books.

Haraway, D. 2003. *The Companion Species Manifesto: Dogs, People and Significant Otherness.* Chicargo: Prickly Paradigm Press (University of Chicago).
Haraway, D. 2008, *When Species Meet*. Minneapolis & London: University of Minnesota Press.

Hargreaves, T., 2011a. Questioning the virtues of pro-environmental behaviour research: Towards a *phronetic* approach *Geoforum* 43(2), pp. 315-324.

Hargreaves, T., 2011b. Practice-ing behaviour change: Applying social practice theory to pro-environmental change. *Journal of Consumer Culture*. 11(1), pp 79-99.

Harris, K., 2000. Socially and environmentally responsible pricing in water in Palmer, G. (eds) Water Charging and Social Justice: Why politicians must act. *New Policy Institute.* Pp. 27-36.

Harrison, D., 2004. It's official – the South-East has less water per head than Sudan. *The Telegraph* available online at: http://www.telegraph.co.uk/news/uknews/4192701/Its-official-the-South-East-has-less-water-per-head-than-Sudan.html last accessed 18.06.2013.

Hart, G. 2002. *Disabling Globalisation: places of power in Post-Apartheid South Africa,* University of Natal Press, Pietermaritizburg.

Hartstock, N., 1998. Moments, margins and agency. *Annuals of the Association of American Geographers*. 80, pp. 707-712.

Harvey, D., 1982. *The Limits to Capital* London: Blackwell.

Harvey, D., 1996. *Justice, Nature and the Geography of Difference.* Oxford*:* Blackwell.

Harvey, D. 1993. The nature of the environment: the dialectics of Social and Environmental change *Socialist Register* 30, 1-31.

Harvey, D. 2001. *Spaces of Capital: towards a critical geography* Edinburgh: University of Edinburgh Press.

Harvey, D., 2007. The Kantian Roots of Foucault's Dilemmas in J Crampton and S Elden (eds) *Space, knowledge and power: Foucault and Geography* Aldershot: Ashgate Publishing Ltd, pp. 41-49.

Harvey, D., 2009. *Cosmopolitanism and the Geographies of Freedom* New York: Columbia University Press.

Harvey, D., 2010. *The Enigma of Capital: And the Crises of Capitalism.* London: Penguin Books.

Harvey, E., 2005. Managing the Poor by Remote Control: Johannesburg's Experiments with Prepaid Water Meters in *The Age of Commodity: Water Privatisation in Southern Africa.*, eds. McDonald, D., & Ruiters, G., London: Earthscan, pp. 120-129.

Hassan, J., 1998. A History of Water in Modern England and Wales. Manchester: Manchester University Press.

Haughton, G., 2002. Market making: Internalisation and global water markets. *Environment and Planning A*, 34(5), pp. 791-807.

Hausman, D., & Welch, B., 2010. Debate: To Nudge or Not to Nudge *The journal of political philosophy* 18(1), 123 - 136.

Helm, D., 1995. *British utility regulation: Principles, experience and reform*. Oxford: Oxera Press.

Herbert, A., & Kempson, E., 1995. Water Debt and Disconnection. London: Policy study Institute.

Herrington, P., 1974. The costs of domestic metering. *Water Services*. 78, pp.306-310.

Herrington P., 1979. Nor any drop to drink: The economics of water. Occasional paper, Economics Association: Surrey.

Herrington, P., 1982. Water: A consideration of conservation. Journal of the Royal Society Arts. London.

Herrington, P., 1989. Deep water investors beware: Water privatisation an alternative prospectus. *Water Industry Unions Committee*. London: The Jason Press Limited.

Herrington, P., 2007. Waste Not, Want Not? Water Tariffs for Sustainability: Report to WWF- UK. Centre for Sustainable Energy: Bristol.

Heynen, N., 2013. Urban political ecology I: The urban century *Progress in Human Geography* published online before print, August 30th, 2013.

Heynen, N.C., Kaika, M., & Swyngedouw, E., 2006. *In the nature of cities: urban political ecology and the politics of urban metabolism*, New York, NY: Routledge.

Hickman, L. 2011. Water companies should sort out their leaks before telling women how to shave *The Guardian* available online http://www.guardian.co.uk/environment/blog/2011/aug/26/water-conservation-women-shower-shaving last accessed 28.06.2013.

Hills, J., 2012. *Getting the Measure of Fuel Poverty: Final Report of the Fuel Poverty Review Summary and Recommendations*. London: Centre for Analysis of Social Exclusion.

Hills, B., Huby, M., Kenway, P., 1997. Fair and sustainable: Paying for Water, what the government could do. London: New Policy Institute.

Himley, M., 2008. Geographies of Environmental Governance: The Nexus of Nature and Neoliberalism. *Geography Compass*, 2(2). Pp. 433-451.

Hinchliffe, S., & Whatmore, S., 2009. Living Cities: Toward a Politics of Conviviality. In *Technonatures: Environments, Spaces and Places in the Twenty-first century*, eds. D. White & C. Wilbert. Waterloo, Canada: Wilfred Laurier University Press. Pp. 105-124.

Hirsch, D., 2013. A minimum income standard for the UK in 2013 *Joseph Rowntree Foundation* available online at: http://www.jrf.org.uk/publications/MIS-2013 last accessed 15th October 2013.

Hitchings, R., Day, D., 2011. How older people relate to the private winter warmth practices of their peers and why we should be interested. *Environment and Planning A*, 43(10), pp. 4452-2467.

Hitchings, R., 2012. People can talk about their practices. *Area*, 44(1). Pp. 61-67.

Hobson, K. 2004. Sustainable Consumption in the UK: The Responsible Consumer and the Government at Arm's Length. *Journal of Environment and Development*. 13(2), 121-139.

Hobson, K., 2006. Bins, Bulbs, and Shower Timers: On the 'Techno-Ethics' of Sustainable *Living, Ethics, Place & Environment*, 9(3), pp. 317-336.

Hobson, K., 2011. Environmental politics, green governmentality and the possibility of a 'creative grammar' for domestic sustainable consumption. In Lane, R., & Gorman-Murray, A., (eds) *Material Geographies of Household Sustainability*. Surrey: Ashgate publishing Ltd. Pp. 193-211.

Hobson, K., 2013. On the making of the environmental citizen. *Environmental Politics*, 22(1), pp. 56-72.

House of Lords and Technology Committee. 2006. Water Management. Volume I: Report, 8th Report of Session 2005-6. London: HMSO.

House of Lords Science and Technology Select Committee. 2011. *Behaviour Change*. 2nd Report of Session 2010-12. HM Stationary Office: London.

Howarth, D. 2011. Privatisation help or a hindrance in managing water demand? National Water Demand Centre: Environment Agency: England.

Hugby, M., 1994. Water Poverty and Social Policy: Review of the Main Issues. Paper delivered at PUAF Water Poverty Conference.

Hunt, A., 2004. Getting Marx and Foucault into Bed Together! *Journal of Law and Society.* 31(4), pp. 592-609.

Huxley, M., 2007. Geographies of Governmentality in *Space, knowledge and power: Foucault and Geography*, (eds). J. Crampton., & S. Elden. England: Ashgate Publishing. pp. 185-205.

Huxley, M., 2008. Space and Government: Governmentality and Geography. *Geography Compass.* 2(5), pp. 1635-1658.

Huxley, M., 2011. A history of the 'Nudge'. In: Pykett, J., Jones, R., & Whitehead, M., (eds) Intervention on The Political Geography of 'Libertarian Paternalism'. *Political Geography*, 30(7), pp. 301-310.

Hyatt, S., 2004. Water is Life, Meters Out! Women's Grassroots Activism and the Privatisation of Public Amenities. *Occasional Papers on Globalisation,* 1(7). pp. 1-18.
Independent Water Review Panel (IWRP) (2007) *Strand One Report: Costs and Funding* Available online: http://www.iwrp-ni.org.uk/iwrp_strand_1_report.pdf last accessed 21/08/2013.

Institution of Civil Engineers (ICE)., 2012. State of the Nation: Water 2012. Available online at: http://www.ice.org.uk/topics/water/Policy/State-of-the-Nation last accessed 01.03.2013.

Jaglin, S., 2008. Differentiating networked services in Cape Town: Echoes of splintering urbanism? *Geoforum*, 39(6). Pp. 1897-1906.

Jenking, R. 1973. Fylde Metering. BGlackpool: Fylde Water Board.

Jessop, B. 1982. *The capitalist state: Marxist theories and methods,* Martin Robertson: Oxford.

Jessop, B., 2007. From micro-powers to governmentality: Foucault's work on statehood, state formation, statecraft and state power. *Political Geography,* 26(1), pp. 3-40.

Jessop, B., 2011. Constituting another Foucault Effect: Foucault on States and Statecraft in Brockling, U., Krasmann., S & Lemke, T., (eds) *Governmentality: Current Issues and Future Challenges* NY & Abingdon: Routledge.

John, P., Cotterill, S., Moseley, A., Richardson, L., Smith, G., Stoker, G,. & Wales, C., 2011. *Nudge, Nudge, Think, Think: experiments with ways to change civic behaviour.* London & New York: Bloomsbury.

Jones, R., Pykett, J., Whitehead, M., 2011a. Governing temptation: Changing behaviour in an age of libertarian paternalism. *Progress in Human Geography,* 35(4), pp. 483-501.

Jones, R., Pykett, J., Whitehead, M., 2011b. The Geographies of Soft Paternalism in the UK: The Rise of Soft Paternalism and Changing Behaviour after Neoliberalism. *Geography Compass* 5(1): pp. 50-62.

Jones, R., Pykett, J., & Whitehead, M., 2013. Changing Behaviours: the Rise of the Psychological State. London: Eiger.

Jordan, A., Richardson, J., & Kimber, R., 1977. The Origins of the Water Act of 1973. *Public Administration*. Pp. 317 -334.

Joyce, P., 2003. *The rule of freedom: liberalism and the modern city*. London: Verso.

Kaika, M., 2004. Interrogating the Geographies of the Familiar: Domesticating Nature and Constructing the Autonomy of the Modern Home. *International Journal of Urban and Regional Research*, 28(2). pp. 265-86.

Kaika, M., 2005. *City of flows: modernity, nature and the city*. New York & Oxon: Routledge.

Kaika, M. 2006. The political ecology of water scarcity: the 1989-1991 Athenian drought. in *In the Nature of Cities: Urban political ecology and the politics of urban metabolism*, eds. N. Heynen, M. Kaika & E. Swyngedouw, New York & London: Routledge, pp. 150-165.

Kearns, R. 2010. Seeing with Clarity: Undertaking Observational Research. In *Qualitative Research Methods in Human Geography* (3rd eds). Canada: OUP.

Kenway, P. 2000. Setting the Principles: Why Politicians Can Make a Difference to Water Charging in Palmer, G. (eds) *Water Charging and Social Justice: Why politicians must act*. London: New Policy Institute.

Kent, W., 1892. *The Water Meter: Its difficulties, types and application – A manual of reference and fact in connection with the supply of water by meter*. London: E &F.N. Spon.

Kinnersley, D. 1988. Troubled water: Rivers, politics and pollution. Hillary Shipman: London.

Kirsch, S., & Mitchell, D., 2004. The Nature of Things: Dead Labour, Nonhuman Actors, and the Persistence of Marxism. *Antipode*, 36(4), pp. 687-705.

Kisby, B., 2010. The Big Society: Power to the People? *Political Quarterly*, 81(4), pp. 484-491.

Knamiller, C., & Sharp, L., 2009. Issues of Trust, Fairness and Efficacy: A Qualitative Study of Information Provision for Newly Metered Households in England. *Water Sci. Technol.: Water Supply*, 9 (3). pp 311–319.

Knights, D., & Vurdubakis, T., 1994. Foucault, Power and all that. In (eds) Jermier, J., Knights, D., Nord, W., *Resistance & Power in organisations*. London: Routledge. pp 17-19.

Kirsch, S. & Mitchell, D. 2004. The Nature of Things: Dead Labour, Nonhuman Actors, and the Persistence of Marxism. *Antipode,* 36(4), pp. 687-705.

Lane, R. & Gorman-Murray A (eds). 2011. Material Geographies of Household Sustainability. Surrey: Ashgate publishing Ltd.

Larner, W. 2000. Neoliberalism: Policy, Ideology, Govermentality. *Studies in Political Economy*. 63(1), pp 5-25.

Larner, W. 2007. Neoliberal governmentalities in Heynen N, McCarthy J, Prudham S and Robbins P (eds) *False Promises and unnatural consequences*. Routledge: New York.

Latour, B., 1993. *We have Never Been Modern.* Brighton: Harvester Wheatsheaf.

Latour, B., 2005. *Reassembling the Social: An Introduction to Actor Network Theory.* Oxford: Oxford University Press.

Lees, L., 2004. Urban Geography: discourse analysis and urban research. *Progress in Human Geography*. 28(1), pp. 101-107.

Legg, S., 2005. Foucault's population geographies: classifications, biopolitics and governmental spaces. *Population, Space and Place*. 11(3), pp. 180-201.

Lemke, T., 2001. The Birth of Bio-Politics: Michael Foucault's lecture at the College de France on neo-liberal rationality. *Economy and Society.* 30(2), pp. 190-207.

Lemke, T., 2002. Foucault, Governmentality and Critique. *Rethinking Marxism*. 14(3), pp 49-64.

Lemke, T. 2007. An indigestible meal? Foucault, governmentality and state theory. *Distinktion*. No 15.

Lemke, T. 2011a. *Bio-politics: An advanced introduction*. New York University Press: New York and London.

Lemke, T. 2011b. Beyond Foucault: From Biopolitics to the Government of Life in Brockling U, Krasmann S and Lemke T (eds) *Governmentality: Current Issues and Future Challenges* Routledge: New York & Oxon, pp. 165-185.

Linton, J., 2010. What is Water? The history of a modern abstraction. Vancouver: University of British Columbia Press.

Littlechild, C., 1986. Economic Regulation of Privatised Water Authorities: A Report Submitted to the Department of the Environment. H.M. Stationary Office.

Lister, R., 1995. Water Poverty. *The Journal of the Royal Society for the Promotion of Health*. 80. Pp. 80-83.

Lobina, E., 2012. Water services governance, technological change and paradigm shifts: a conceptual framework. *International Journal of Water* 6(4/4). pp. 155-175.

Loftus, A., 2006. Reification and the Dictatorship of the Water Meter. *Antipode*. 38(5), pp. 1023-1045.

Loftus, A., 2012. *Everyday Environmentalism; Creating an Urban Political Ecology*. Minneapolis: University of Minnesota Press.

Luke, T., 2009. The property boundaries/boundary properties in Technonature Studies: inventing the future. In *Technonatures: Environments, Technologies, Spaces, and places in the Twenty-first century* (eds.) D. White & C. Wilbert, Wilfred Laurier University Press: Ontario, Canada, pp. 193-213.

MacFarlane, C. & Rutherford, J. 2008. Political Infrastructures: Governing and Experiencing the Fabric of the City *International Journal of Urban and Regional Research* 32(2), 363-74.

MacKinnon, D., 2000. Managerialism, governmentality and the state: a neo-Foucauldian approach to local economic governance. *Political Geography*. 19(3), pp. 293-314.

Malik, S., 2013. Jobseekers' psychometric test 'is a failure' *The Guardian* available online http://www.guardian.co.uk/society/2013/may/06/jobseekers-psychometric-test-failure last accessed 27.06.2013.

Maloney, W., & Richardson, J., 1994. Water policy making in England and Wales: Policy communities under pressure? *Environmental Politics, 3(4). Pp. 110-138.*

Maniates, M., 2001. Individualisation: Plant a Tree, Buy a Bike, Save the World? *Global Environmental Politics,* 1(3). pp. 31-52.

Marion, Young, I., 1998. Harvey's complaint with race and gender struggles: a critical response. *Antipode* 30(1), 36-42.

Marvin, S., Chappells, H. & Guy, S. 1999. Pathways of smart metering development: shaping environmental innovation, *Computers, Environment and Urban Systems*, vol. 23(2), pp. 109-126.

Marvin, S., Chappells, H., & Guy, S., 2011. Smart Meters as Obligatory Intermediaries: Reconstructing Environmental Action. In Guy, S., Marvin, M., Medd, W., & Moss, T., 2011. Shaping Urban Infrastructures: Intermediaries and the Governance of Socio-Technical Networks. London & Washington: Earthscan.

Marvin, S., & Graham, S., 2001. *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*. London: Routledge.

Mayo, E., 2013. Nudged out: this is mutualisation, but not as we know it *The Guardian* available online http://www.guardian.co.uk/commentisfree/2013/may/03/nudge-unit-mutualisation-but-not-as-we-know-it last accessed 27.06.2013.

McCarthy, J., & Prudham, S., 2004. Neoliberal Nature and the Nature of Neoliberalism, *Geoforum*, 35(4), pp. 275-283.

McCulloch, C., 2009. The Water Resources Board: England and Wales' Venture into National Water Resources Planning, 1964-1973. 2(3). Pp. 461-475.

McDowell, L. 1998. Elites in the city of London: some methodological considerations Environment and Planning A, 30(12), 2133–46.

McDowell, L., 2010. Interviewing: Fear and Liking in the Field. In DeLyser, D., Herbert, S., Aitken, S., Crang M and McDowell (eds) *The SAGE Handbook of Qualitative Geography,* London Sage, pp. 156-172.

McFarlane, C., & Rutherford, J., 2008. Political Infrastructures: Governing and Experiencing the Fabric of the City, *International Journal of Urban and Regional Research,* 32(2), pp. 363-377.

Medd, W., & Chappells, H., 2007. Drought. Demand and the scale of resilience: challenges for interdisciplinary in practice. 32(2), pp. 233-248.

Michael, M., 2006. *Technoscience and Everyday Life.* Berkshire: Open University Press.

Miller, P. and Rose, N. 1990. Governing economic life *Economy and Society,* 19(1), 1-31.

Miller, P. & Rose, N., 2008. *Governing the present: Administering Economic, Social and Personal Life.* London: Polity Press.

Mills, C., 2012. Why Nudges Matter: A reply to Goodwin. *Politics*. 33(1), pp 28-36.
Ministry of Housing and Local Government, 16th June 1967 Memorandum.

Morris, W. R Esq., 1868. Royal Commission on Water Supply: minutes of evidence and appendices 1867-1868. London Metropolitan Archives.

Moss, T., 2008. 'Cold spots' of Urban Infrastructure: 'Shrinking' Processes in Eastern Germany and the Modern Infrastructural Ideal, *International Journal of Urban and Regional Research,* 32(2). pp. 436-451.

Moss, T. Guy, S. Marvin, S. Wedd, W. 2011. Intermediaries and the Reconfiguration of Urban Infrastructures: An Introduction. In Guy, S. Marvin, M. Medd, W. Moss, T. 2011. Shaping Urban Infrastructures: Intermediaries and the Governance of Socio-Technical Networks. Earthscan: London and Washington.

Muller, M., 2008. Free Basic Water - a sustainable instrument for a sustainable future in South Africa. *Environment and Urbanisation,* 20(1). pp. 67-87.

Nash, F., 2013. Participation & Passive Revolution: The Reproduction of Neoliberal Water Governance in South Africa. *Antipode,* 45(1). Pp. 101-120.

National Audit Office. Infrastructure investment: the impact on consumer bills. London: HMSO.

North, P., 2011. Geographies and utopias of Cameron's Big Society *Social & Cultural Geography,* 12(8), pp. 817-827.

Northumbrian Water. 2013. *Your essential guide to our charges scheme 2013/14.* Available online http://www.nwl.co.uk/_assets/documents/Charges_Scheme_2013-14_-_Northumbrian_Region.pdf last accessed 15.07.2013.

Nussbaum, M., 2003. Capabilities as Fundamental Entitlements: Sen and Social Justice *Feminist Economics* 9 (2-3), pp. 33-59.

Ockenden, K., 2012. In full flow: Tony Smith interviewed *Utility Week* Available online http://www.utilityweek.co.uk/news/news_story.asp?id=196431&title=In+full+flow%3A+Tony+Smith+interviewed last accessed 23 August 2013.

O'Farrell, C., 2005. *Michel Foucault* London: Sage Publishing Ltd.

O'Malley, P., Weir, L., & Shearing, C., 1997. Governmentality, criticism, politics, *Economy and Society* 26(4), pp. 501-517.

Ofwat. 1991. *Paying for Water*. Ofwat: Birmingham.

Ofwat. 1993. *Paying for Growth* Ofwat: Birmingham.

Ofwat. 2000. *Approval of companies' charges schemes 2001-2002*: Ofwat's conclusions on the consultation. Ofwat: Birmingham.

Ofwat. 2003. *Tariff structure and charges: 2003 - 04 report.* Ofwat: Birmingham.

Ofwat/CCWater. 2008. *Research into Household Customers' Views on Competition on the Water and Sewerage Industry*. Ofwat: Birmingham.

Ofwat. 2009a. *Ofwat's response to the independent review of charging for household water and sewerage services: protecting consumers, promoting value, safeguarding the future.* Ofwat: Birmingham.

Ofwat, 2009b. To Regulatory Directors of all water and sewerage companies and water only companies. PR09/31. Available online at: http://www.ofwat.gov.uk/pricereview/pr09phase3/ltr_pr0931_revcorrectmech last accessed 04.02.2013.

Ofwat, 2010a.The Development of the Water Industry in England and Wales. Birmingham: Ofwat.

Ofwat. 2010b. *A drain on society – what can be done about water debt?* Birmingham: Ofwat.

Ofwat 2010 Service and delivery – performance of the water companies in England and Wales 2009-10. Ofwat: Birmingham.

Ofwat. 2010c. *Waste not. Want not – making the best use of our water* Ofwat: Birmingham.

Ofwat. 2010. Beyond limits: how should prices for monopoly water and sewerage services be controlled. Ofwat: Birmingham.

Ofwat. 2010. Resilient supplies: How do we ensure secure water and sewerage services? Ofwat: Birmingham.

Ofwat. 2011a. *Push, pull, nudge: How can we help customers save water, energy and money?* Birmingham: Ofwat.

Ofwat. 2011b. Horizons Water affordability: evidence and issues workshop. Ofwat: Birmingham.

Ofwat. 2011c. Information Notice: Simplifying the Revenue Correction Mechanism. Available online at: http://www.ofwat.gov.uk/regulating/prs_in1104rcm.pdf ;last accessed 06.12.2012.

Ofwat. 2011d. Affordability and debt 2009-10 –supporting information. Ofwat: Birmingham.

Ofwat. 2011e. Exploring the costs and benefits of faster, more systematic water metering in England and Wales. Ofwat: Birmingham.

Orwell, G., 1937. *The Road to Wigan Pier*. London: Penguin.

Osborne, T., 1996. Security and vitality: drains, liberalism and power in the nineteenth century in Barry, A., Osborne, T., & Rose, N., (eds). 1996 *Foucault and Political reason: Liberalism, neo-liberalism and rationalities of government*. UCL Press: London.

Page, B., 2005. Paying for water and the geography of commodities. *Transactions of the Institute of British Geographers*. 30(3), pp. 293-306.

Paine, A, (eds). 2007. *The Complete Letters of Mark Twain*. Middlesex: The Echo Library.

Painter, J., 2006. Prosaic geographies of stateness. *Political Geography*, 25(7), pp. 752-774.

Palmer, G., (eds) *Water Charging and Social Justice: Why Politicians Must Act*. London: New Policy Institute.

Parker, J., & Wilby, R., 2013. Quantifying household water demand: a review of theory and practice in the UK *Water Resource Management,* 27(4). Pp. 981-1011.

Patterson, M., & Stipple, J., 2010. Myspace: Governing individuals' carbon emissions. *Environment and Planning C: Society and Spac*e. *28(2), pp. 341-362.*

Peck, J., 2010. Zombie Neoliberalism and the ambidextorous state. *Theoretical Criminology*. 14(1). Pp. 104-110.

Peck, J., & Ticknell, A., 2002. Neoliberalising Space. *Antipode,* 34(3). pp. 380-404.

Philo, C., 1992. Foucault's Geography *Environment and Planning D: society and space*. 10(2), 137-67.

Philo, C., 2012. A 'new Foucault' with lively implications – or 'the crawfish advances sideways'. *Transactions of the Institute of British Geographers*. 37(4), pp. 496-514.

Pigeon, M., McDonald, D., Hoedeman, O., & Kishimoto, S., (eds). 2012. *Remunicipalisation: putting water back into public hands*. Amsterdam: Transnational Institute.

Pratt, G., 2002. Studying Immigrants in Focus Groups. In Moss, P (eds). *Feminist Geography in Practice: Research and Methods,* Oxford: Blackwell.

Pritchard, S., 2011. *Confluence: the Nature of Technology and the Remaking of the Rhone* Massachusetts: Harvard University Press.

Pritchard, S., 2012. From hydroimperalism to hydrocapitalism: 'French' hydraulics in France, North Africa and beyond. *Social Studies of Science. Pp.* 42(4), 591- 615.

Prudham, S., 2004. Poisioning the well: neoliberalism and the contamination of municipal water in Walkerton, Ontario. *Geoforum,* 35(3), pp. 343-359.

PUAF.1990. Water-prepayment metering? The social implications. PUAF discussion paper

Nov 1990.

PUAF, 1993. Transcription of Lower Grange Campaign for Water Meter Justice Committee Meeting with Ian Byatt, Director General of Ofwat, Leeds. PUAF archives 1993.

PUAF, 1994. Letter from anonymous to Helen Jackson MP. PUAF archives 1994.

Pullinger, M., Browne, A., Anderson, B., & Medd, W., 2013. Patterns of water: The water related practices of households in southern England, and their influence on water consumption and demand management. Lancaster: Lancaster University.

Pykett, J., Jones, R., Whitehead, M., Huxley, M., Strauss, K., Gill, N., McGeevor, K., Thompson, L., & Newman, J. 2011. Interventions into the political geography of 'libertarian paternalism'. *Political Geography,* 30(6), pp 301-310.

Quality of Life Policy Group. 2007. Blueprint for a Green Economy: Submission to the Shadow Cabinet. London.

Rabinow, P., 1984. *The Foucault Reader: An introduction to Foucault's thought*. London: Penguin.

Rabinow, P., & Rose, N., 2006. Biopower Today, *Biosocieties*, vol. 1, pp. 195-217.

Raco, M., 2003. Governmentality, subject-building, and the discourse and practices of devolution in the UK. *Transactions of the Institution of British Geographers*, 28(1). Pp. 75-95.

Raco, M. 2009. From expectations to aspirations: State modernization, urban policy, and the existential politics of welfare in the UK. *Political Geography* 28(7) 436-444.

Raco, M., & Imrie, R., 2000. Governmentality, rights and responsibilities in urban policy, *Environment and Planning A,* 32(12), pp. 2817-2204.

Rawls, J., 1971. *A Theory of Justice*. USA: Library of Congress

Rose, N., & Miller, P., 2010. Political power beyond the State: problematics of government. *British Journal of Sociology*, 61(1). Pp. 271-303.

Reckwitz, A., 2002. Toward a theory of social practices: a development in culturalist theorising *European Journal of Social Theory*, 5(1), pp. 243-263.

Reid, S., 2009. Using Science to create a better place: The impact of household water metering in South East England. Bristol: Environment Agency.

Reid, S., & Acutt, M., 2011. What do customers want from their water companies? *Utility week* available online http://www.utilityweek.co.uk/news/news_story.asp?id=195172&title=What+do+customers+want+from+their+water+companies%3F last accessed 09.07.2013

Reuters. 2013. Fitch affirms Southern Water's Senior Secured Debt at 'A-'/'BBB' available online at http://www.reuters.com/article/2013/09/20/fitch-affirms-southern-waters-senior-sec-idUSFit67009320130920 last accessed 12 November 2013.

Reynaud, A., 2007. Social policies and private sector participation in water supply – the case of France. United Nations Research Institute for Social Development.

Rice, G., 2010. Reflections on interviewing elites, *Area* 42(1). pp. 70-75.

Robbins, P., 2007. *Lawn People: How Grasses, Weeds and Chemicals Make Us Who We Are*. Philadelphia: Temple University Press.

Roberts, A., 2008. Privatising Social Reproduction: The Primitive Accumulation of Water in an Era of Neoliberalism, *Antipode*, 40(4), pp. 535-560.

Robertson, M. 2010, Performing environmental governance *Geoforum* 41(1), 7-10.

Robertson, M. 2012. Measurement and alienation: making a world of ecosystem services. *Transactions of the Institute of British Geographers* 37(3), 386-401.

Rose, G., 1997, Situating Knowledges: Positionality, Reflexivities and Other Tactics. *Progress in Human Geography,* 21(3). Pp. 305-320.

Rose, N., 1991. Governing by numbers: figuring out democracy. *Accounting, Organisations and Society*. 16(7), pp. 673-692.

Rose, N., 2007. The Politics of Life Itself: Biomedicine, Power and Subjectivity in the Twenty-First Century. New Jersey: Princeton University Press.

Roth, M., 1981. Foucault's "History of the Present". *History and Theory* 20(1), pp. 32-46.

Routledge, P., 2008. Acting in the Network: ANT and the politics of generating associations. *Environment and Planning D: Society and Space,* 26. Pp. 199-217.

Rudy, A., & Gareau, B., 2005. Actor-Network Theory, Marxist Economics and Marxist Political Ecology. *Capitalism Nature Socialism.* 16(4) 85-90.

Ruiters, G., & Smith, L., 2006.The public/private conundrum of urban politics: a view from South Africa. In Heynen, Swynegdouw, E., (ed) I*n the Nature of Cities, Urban Political Ecology.* New York: Routledge.

Rumming, K., 2009. Following the Actors: mobilizing an actor-network theory methodology in geography. Australian Geographer, 40(4). pp. 451-469.

Rutherford, S., 2007. Green governmentality: insights and opportunities in the study of nature's rule. *Progress in Human Geography.* 31(3), pp. 291-307.

Rutherford, P., & Rutherford, S., 2013a. The Confusions and Exuberances of Biopolitics *Geography Compass,* 7(6), 412-422.

Rutherford, S., & Rutherford, P., 2013b. Geography and Biopolitics, *Geography Compass* 7(6) pp. 423-434.

Rutland, T. & Aylett, A., 2008. The work of policy: actor networks, governmentality, and local action on climate change in Portland, Oregon. *Environment and Planning D: Society and Space*, 26(4), pp. 627-646.

Rydin, Y., 2005. Geographical knowledge and policy: the positive contribution of discourse studies. 37(1), pp. 73-78.

Saal, D., & Parker, D., 2001. Productivity and Price Performance in the Privatised Water and Sewerage Companies of England and Wales. *Journal of Regulatory Economics*. 20(1), pp. 61-90.

Said, E., 2003 [1978]. *Orientalism*. London: Penguin.

Sawkins, J., & Dickie, V., 2005. Affordability of Household Water and Sewerage Services in Great Britain *Fiscal Studies,* 26(2). Pp. 225-244.

Sen, A., 1999. *Development As Freedom*. Oxford, Oxford University Press.

Scholesser, K., 2008. Bio-Political Geographies. *Geography Compass.* 2(5), 1621-1634.

Shaoul, J., 1997. A critical financial analysis of the performance of privatized water industries: the case of England and Wales. *Critical Perspectives on Accounting. 8(5), pp.479-505.*

Sharp, L., McDonald, A., Sim, P., Knamiller, C.,Selton, C., & Wong, S., 2011. Positivism, post-positivism and domestic water demand: interrelating science across the paradigmatic divide *Transactions of the Institute of British Geographers.* 6(4), 501-515.

Shove, E., 2004. Comfort, Cleanliness and convenience: the social organization of normality. London: Berg.

Shove, E., 2010. Beyond the ABC: climate change policy and theories of social change *Environment and Planning A*. 42(1), pp. 1279-1285.

Shove, E., 2011. How the social sciences can help climate change policy: An extraordinary lecture at the British Library 17th Jan 2011. Available online http://www.lancaster.ac.uk/staff/shove/exhibits/transcript.pdf last accessed 18th Nov 2013.

Shove, E., Pantzar, M., Watson, M., 2012. The Dynamics of Social Practice and how it Changes. London: Sage.

Shove, E., & Panzar, M., 2005. Consumers, producers and practices: understanding the invention and reinvention of Nordic walking. *Journal of Consumer Culture*. 5(1), pp. 43-64.

Siemens, SG., 1856. On an improved water meter. Excerpt minutes of proceedings of the meeting of the Institution of Mechanical Engineers. Birmingham, 30th July 1856.

Silverman, D., 2010. *Doing Qualitative Research* 3rd Edition. London: Sage.

Smith, T. 2012. *The Water White Paper is a positive vision for the future of the industry but questions remain on the issues of competition and affordability* available online at: http://eprints.lse.ac.uk/44053/1/__Libfile_repository_Content_LSE%20Politics%20and%20Policy%20Blog_April%202012%20to%20be%20added_blogs.lse.ac.uk-The_Water_White_Paper_is_a_positive_vision_for_the_future_of_the_industry_but_questions_remain_on_the.pdf last accessed on 04.05.2013.

Social Research. 2011. Customer Research on South East Water's Metering Programme: Draft report to South East Water. SEW: Snodland.

Simmons, D., 2012. Southern Water: Universal Metering Programme Measuring Leakage in 2015. Presentation delivered at Water UK Leakage 2012.

Sofoulis, Z., 2005. Big Water, Everyday Water: A Sociotechnical Perspective. *Continuum: Journal of Media & Cultural Studies*. 19(4). Pp. 445-463.

Sofoulis, Z. 2011. Skirting complexity: the retarding quest for the average user. *Continuum* 25(6), 795-810.

South East Water. 2009. South East Water's Future Plans 2010-2015. SEW: Snodland.

South East Water. 2010. Water Resources Management Plan 2010-2035: Final Plan. Snodland: SEW PLC.

South East Water. 2012. Charges Scheme 2012- 2013

South East Water. 2013. Charges Scheme 2013-14.

South West Water. 2013. Charges scheme 2013-14

Southern Water. 2009a. Water Resources Management Plan 2010-2035.

Southern Water. 2009b. Final Business Plan B.8 Tariffs and Revenue Projections. SRN: Snodland.

Southern Water. 2009c. Final Business Plan. C4(A) Supply Demand Appraisal (Water Services). SRN: Snodland.

Southern Water. 2012a. Water and Sewerage Charges 2013-14: A guide for metering programme customers.

Southern Water. 2012b. £1 million benefits boost for customers *Press release 06/12/2012* available online from http://www.southernwater.co.uk/about-us/news/Default.asp?wdgt16460661=0_0_16464784_2012_12_0_0_76463096 last accessed 17.09.2013.

Southern Water. 2013a. Water and Sewerage Charges 2013-14 A guide for customers who are part of South East Water's Customer Metering Programme. Worthing: UK.

Southern Water. 2013b. Annual Report and Accounts 2012-13: Connecting with our customers.

Smith, N,. 1990. *Uneven Development: nature, capital and the production of space*, 2nd edn, Oxford: Blackwell.

Smith, N. 2007. Another Revolution is Possible: Foucault, Ethics and Politics. *Environment and Planning D: Society and Space.* 25(1), 191-193.

Smith N., 2008. *Uneven Development: Nature, Capital and the Production of Space.* 3rd edn, The Georgia: University of Georgia Press.

Smith, T. 2012. The Water White Paper is a positive vision for the future of the industry but questions remain on the issues of competition and affordability. Available online at: http://blogs.lse.ac.uk/politicsandpolicy/archives/22473 last accessed 05.07.2013.

Snell, C., & Bradshaw, J., 2008. *Water Affordability in England and Wales: A report prepared for CCWater*. University of York and CCWater.

Strang, V., 2004. *The Meaning of Water*. Oxford: Berg.

Strengers Y., 2009. *Bridging the Divide between resource management and everyday life: Smart metering, comfort and cleanliness.* PhD thesis. RMIT

Strengers, Y., 2012. Peak electricity demand and social practice theories: reframing the role of change agents in the energy sector *Energy Policy* 44(1),pp. 226-234.

Swynegdouw E., 2004, *Social Power and the Urbanisation of Water: Flows of Power*. *Oxford:* Oxford University Press.

Swynegdouw E., 2006. Metabolic urbanisation: the making of cyborg cities. in *In the Nature of Cities: Urban political ecology and the politics of urban metabolism* (eds.) N. Heynen, M.

Kaika & E. Swyngedouw. New York & London: Routledge, pp. 20-40.

Swynegdouw E., 2007. Technonatural Revolutions: the scalar politics of Franco's hydro-social dream for Spain, 1939-1975. *Transactions of the Institute of British Geographers*, 32(1), pp. 9-28.

Swynegdouw, E., 2009. Circulations and Metabolisms: (Hybrid) Natures and (Cyborg) Cities in *Technonatures: Environments, Technologies, Spaces and Places in the Twenty- first Century*, (eds). D. White & C. Wilbert, Wilfred Laurier University Press: Waterloo, Canada, pp. 61-84.

Taylor, V. & Trentmann, F., 2011. Liquid Politics and the politics of everyday life in the modern city. *Past and Present*, 211. Pp. 199-241.

Thaler, R., & Sunstein, C., 2009. Nudge: Improving decisions about health, wealth and happiness. London: Penguin.

Tibbetts, G., 2007. Millions face compulsory water metering. *The Telegraph* Available online at: http://www.telegraph.co.uk/news/uknews/1560575/Millions-face-compulsory-water-metering.html last accessed 03.03.2014.

Tinson, A., & Kenway, P., 2013. The water industry: a case to answer. A report by the New Policy Institute. London: UNISON & NPI.

Trentmann, F., & Taylor, V., 2005. From users to consumers: water politics in nineteenth century London. In *The making of the consumer: knowledge, power and identity in the modern world*. Oxford: Berg Publishers, pp. 53-79.

Taylor,V,. Chappells, H., Medd, W., & Trentmann, F., 2009. Drought is normal: the socio-technical evolution of drought and water demand in England and Wales 1893-2006. *Journal of Historical Geography*. 35(1), pp.568-591.

Thames Water. 2010. *Our plans for 2010-2015.* Available online at: http://www.thameswater.co.uk/tw/common/downloads/aboutus/our-plans-for-2010-2015.pdf last accessed 20.05.2013.

Thames Water. 2013a. *Our draft five-year plan 2013-2020* 12303 04/2013 Available online: http://www.thameswater.co.uk/pr14/business-plan-complete-document.pdf last accessed 05/06/2013.

Thames Water. 2013b. *Our draft Water Resources Management Plan 2015-2040: Overview and Consultation* 12275 04/13 Available online: http://www.thameswater.co.uk/tw/common/downloads/wrmp/WRMP_A4_36_page_WEB.pdf last accessed on 05.06.2013.

Thames Water. 2013c. Metered charges: water and wastewater charges if you have a water meter 2013-14. Available online from http://www.thameswater.co.uk/tw/common/downloads/your-home/Metered_Charges_2013-2014.pdf. Last accessed 15.07.2013.

The Water Engineer's Pocket Book and Directory. 1929. A Comprehensive guide to the water undertakings of Great Britain and Ireland. London: Water and Engineering.

The Water Engineer's Pocket Book and Directory. 1930. A Comprehensive guide to the water undertakings of Great Britain and Ireland. London: Water and Engineering.

The Water Engineer's Pocket Book and Directory. 1931. A Comprehensive guide to the water undertakings of Great Britain and Ireland. London: Water and Engineering.

Thompson, A., 2010. "Daily life" not a "moment" like the rest: notes on Harvey's "organising for the anti-capitalist transition. *A journal for and about social movements*, 2(1), pp. 271-286.

Trentmann, F., & Taylor, V., 2011. Liquid politics: water and the politics of everyday life in the modern city. *Past and Present* 21(1). Pp. 199-241.

Turner, G., 2013. Money down the drain: getting a better deal for consumers from the water industry. London: Centre Forum.

Unison. 2011. Response to the Department for Environment, Food and Rural Affairs, Affordable Water: a Consultation on the Government's Proposals following the Walker Review of Charging.

Utility Week. 2011. Southern Water pursues universal metering to relieve pressure on resources available online from http://www.utilityweek.co.uk/news/news_story.asp?id=195061&title=Southern+Water+pursues+universal+metering+to+relieve+pressure+on+resources last accessed 17.09.2013

Utility Week. 2012a. Social tariffs cannot be left to companies, says Shuker *Utility Week* available online from http://www.utilityweek.co.uk/news/news_story.asp?id=196425&title=Social+tariffs+cannot+be+left+to+companies%2C+says+Shuker Last accessed 16.09.2013.

Utility Week. 2012b. Metering benefits Southern householders by more than £70 000 in tax credits available online at http://www.utilityweek.co.uk/news/news_story.asp?id=197320&title=Metering+benefits+Southern+householders+by+more+than+%26%23163%3B700%2C000+in+tax+credits Last accessed on 23.08.2012.

Utility Week. 2013. Have water companies gone far enough for Ofwat? Available online at: http://www.utilityweek.co.uk/news/have-water-companies-gone-far-enough-for-ofwat/952352#.UpymKMRSh8F last accessed 02.12.2013.

Valentine, G., 1997. Tell me about...Using interviews as a research methodology, in Flowerdew, R. and Martin, D. (eds.) *Methods in Human Geography: a Guide for Students Doing a Research Pr*oject. London: Longman.

Vogel, S. 2011. On Nature and Alienation in a Biro (eds) *Critical Ecologies: The Frankfurt School and Contemporary Environmental Crises* University of Toronto Press: Toronto and London. Pp 187-206.

Von Schnitzler, A., 2008. Citizen Prepaid: Water, Calculability, and Techno-Politics in South Africa. *Journal of Southern African Studies,* 34(4), pp. 899-917.

Walker, A., 2009. *The Independent Review of Charging for Household Water and Sewerage Services*, London: DEFRA.

Walker, G., 2012. A critical examination of models and projections of demand in water utility resource planning in England and Wales, *International Journal of Water Resources Development*, 29(3). Pp. 352-372.

Walker, G., and Burningham, K., 2011. Flood Risk, Vulnerability and Environmental Justice: evidence and evaluation of inequality in a UK context *Critical Social Policy,* 31(2), pp. 216-240.

Walker, G., and Day, R., 2012. Fuel Poverty as injustice: integrating distribution, recognition and procedure in the struggle for affordable warmth *Energy Policy* 49, pp. 69-75.

Walker, T., 1883. Croydon Water Works report upon the application of the Waste Water System for the direction of waste water in Croydon. London: Howard & Jones.

Walters, W. 2012. *Governmentality: Critical Encounters*. Routledge: London.

Ward, C., 1997. *Reflected in water: a crisis of social responsibility*. London. Cassell.

Ward, K., 2010. Towards a relational comparative approach to the study of cities, 34(4). Pp. 471-487.

Water Briefing. 2012. Southern Water at risk of credit rating downgrade *Water Briefing* available online at: http://waterbriefing.org/index.php/home/finance-and-risk/item/5711-southern-water-at-risk-of-credit-rating-downgrade last accessed 12th May 2012.

Water UK. 2009. Briefing note on "Reduced Flow" (or "Trickle Flow" devices. Available online at: http://www.water.org.uk/home/policy/positions/reduced-flow-devices/reduced-flow-devices.pdf last accessed. 03.03.2012.

Water Voice & Ofwat. 2003. Paying for Water: Customer Research. Birmingham: Ofwat.

Watherston, E., 1876. The Waste Water System (2nd ed). Liverpool: Waste Water Meter Company Co Ltd.

Watts, M., 1998, Nature as Artiface and Artifact in *Remaking reality: Nature at the millennium*, eds. B. Braun & N. Castree, London: Routledge, pp. 243-270.
Wessex Water. 2011. Towards sustainable Water Charging: Interim findings from Wessex Water's trial of alternative charging structures and smart metering.

Wessex Water. 2013. Charges scheme 2013-14.

Wild, J., 2013. Household water bills to rise 3.5% *Financial Times* available online http://www.ft.com/cms/s/0/82a5c78e-6f74-11e2-b906-00144feab49a.html#axzz2d67i4XVB last accessed 26 August 2013.

Wilkins, A., 2013. Libertarian paternalism: policy and everyday translations of the rational and the emotional *Critical Policy Studies*. 7(4), pp. 395-406.

Whatmore, S., 2002. *Hybrid Geographies, Natures, Cultures and Spaces.* London*:* Sage.

Whatmore, S., 2009. Mapping knowledge controversies: science, democracy and the redistribution of expertise. *Progress in Human Geography, 1-12.*

White, D., & Wilbert, C., (eds) 2009. *Technonatures: Environments, Technologies, Spaces and Places in the Twenty- first Century*, Ontario: Wilfred Laurier University Press.

Winchester, H., & Rofe. M. 2010, Qualitative research and its place in human geography.In Haye, I. (Ed), *Qualitative Research Methods in Human Geography*. Don Mills: Oxford University Press.

Wohl, A., 1983. Endangered lives: public health in Victorian Britain. Cambridge: Harvard University Press.

World Bank., 2011. PPP in Infrastructure Resources Center: Full divestiture/Privatisation. Available online from http://ppp.worldbank.org/public-private-partnership/agreements/full-divestiture-privatization last accessed 02.02.2011.

Wright, O. 2013. The great Civil Service sell-off: Dozens of services and 75, 000 staff set to be transferred to private sector. *The Independent.* Available online: http://www.independent.co.uk/news/uk/politics/the-great-civil-service-selloff-dozens-of-services-and-75000-staff-set-to-be-transferred-to-private-sector-8598188.html last accessed 27.06.2013.

Young, D., & Keil, R., 2007. Re-regulating the urban water regime in neoliberal Toronto in Heynen N, McCarthy J, Prudham S and Robbins P (eds) *False Promises and unnatural consequences* NY: Routledge

Yusoff, K., 2011. The Valuation of Nature: The Natural Choice White Paper *Radical philosophy* no. 170, pp. 2-7.